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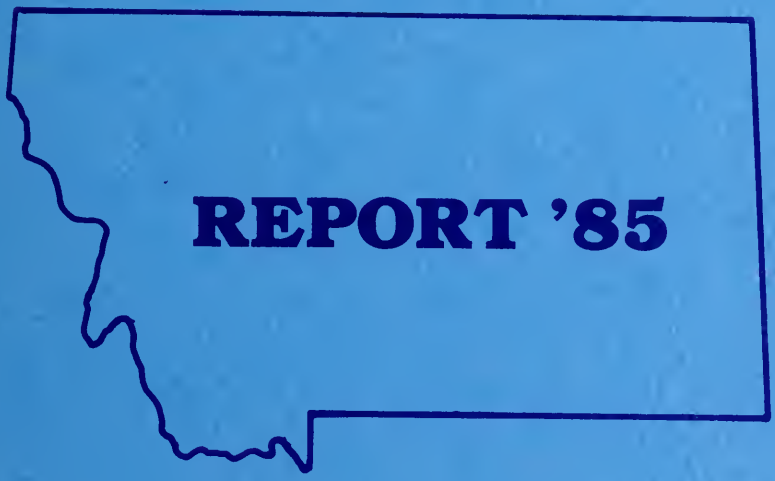

REPORT '85

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	**i**
INTRODUCTION	**ii**
TELEPHONE SYSTEMS AND EQUIPMENT	**1**
"Big Four" Operation and Savings	1
Other Replacement Projects - 1983 and 1984	2
Future Replacement Projects - 1985 and 1986	3
STATE TELEPHONE NETWORK (STN)	**4**
STN Reconfiguration	4
TELPAK Rate Case Intervention	5
Telecommunications Policy Advisory Council	5
Short-Term RFP	6
DATA COMMUNICATIONS NETWORK (DCN)	**7**
DCN Reconfiguration	7
Enhance Dial-up Security	8
Asynchronous System Network	9
Consolidate Expenditures	9
PUBLIC SAFETY COMMUNICATIONS PLANNING	**10**
State Agency High-Band Conversions	10
Frequency Coordination	11
Mutual Aid Frequency Development	12
Other Public Safety Communications Projects	13
LAND MOBILE RADIO PROGRAMS FY86-87	**APPENDIX A**
LAND MOBILE RADIO FREQUENCIES, POLICIES AND PROCEDURES	**APPENDIX B**

EXECUTIVE SUMMARY

1983 and 1984 represent two of the most volatile years in the history of telecommunications. In this two year span the industry's largest corporation, AT&T, divested itself of its regional Bell operating companies and the telecommunication's equipment marketplace was deregulated. It is safe to say that, as a result, the industry has taken on an entirely new look.

During this same time, the State completed the installation of 11 state owned PBX's (Private Branch Exchange) which resulted in the replacement of over 12,000 telephones in state offices. This replacement project termed the "Big Four", saved the State approximately $736,000 in 1984, and was a major step towards improving telecommunications systems statewide. Several other replacement projects are scheduled for 1985 and 1986.

The State Telephone Network (STN) increased in cost by over 60% during 1983 and 1984. To counteract these increases the State reconfigured the STN in 1983 and now has the capability to continually monitor the STN to reduce network costs.

Long term network planning has taken place with the involvement of the Telecommunication's Policy Advisory Council (TPAC) appointed by the Director, Department of Administration. TPAC recommended that bids for the stabilization of short-term network costs be developed and published by the Department in 1985. Furthermore, TPAC asked for long-term network alternatives to be developed during FY86 and 87 by the Department and an advisory council with the assistance of a third party telecommunications consultant. Alternatives and recommended solutions developed during the biennium are to be presented to the 1987 Legislative Assembly.

Montana's Data Communications Network (DCN), like the STN, has increased in cost by over 60% during 1983 and 1984. Similarly, data circuit growth is projected to be 25%-35% per year in addition to a doubling of terminals. In 1985 the DCN will be reconfigured to incorporate the Law Enforcement Network to include regional data concentrators which will help minimize circuit costs. Additionally, spending authority to link the university campus computers together to share software and spare storage has been requested for the biennium.

In 1983 and 1984, Montana made steady progress in the area of land-mobile radio communications. During that time, several state and local agencies converted their radio systems from low-band frequency to high-band frequency equipment. State agencies' plans and budgets project a continuation of high-band frequency conversion. The Highway Patrol, the Highway Department, and the Fire Suppression Bureau projects are the major conversion projects for the biennium.

INTRODUCTION

The report Telecommunications Plan 82 defined the strategies set by the State to respond to the divestiture of AT&T and the advent of the new multivendor marketplace. Telecommunications Report 85 is the sequel to that report and describes the major telecommunications activities that occurred in 1983 and 1984, and the current major telecommunications planning objectives for the State.

In May, 1984 the Communications Division of the Department of Administration was consolidated as a Bureau within the new Information Services Division. The Telecommunications Bureau prepared Telecommunications Report 85 in January 1985 consistent with the strategies and objectives for information systems planning described in the document Statewide Information Systems Plan, published in December 1984 by the Information Services Division.

Copies of the Telecommunications Report 85 may be obtained by writing:

Telecommunications Bureau
Room 222, Mitchell Bldg.
Helena, MT 59620

TELEPHONE SYSTEMS AND EQUIPMENT

In December of 1982, the State and the Montana University System collectively entered into an agreement with Centel Business Systems for the replacement of the existing telephone systems at the following locations:

Eastern Montana College, Billings
Montana State University, Bozeman
University of Montana and State Forester, Missoula
State Capitol Complex and Satellites, Helena

This major project, termed the "Big Four," initiated the installation of 10 State-of-the-Art PBX's comprised of over 12,000 instruments, all systematically cutover and interconnected by the State Telephone Network (STN).

The "Big Four Project" was completed in December 1983 and represents the single most important step taken by the State of Montana to improve voice communications and stabilize costs. As a result the State is better prepared to respond to the future complexities of developments in the telecommunications field.

"Big Four" Operation and Savings

1984 was the first full year of operation of the State's new telephone systems. Throughout the first year each PBX demonstrated its flexibility to accommodate changes in the number of operating stations. Three of the "Big Four" PBX's grew an annual rate of 4% while a multitude of changes to feature availability and location of phones were made by full-time on site technicians. From an operations standpoint, the "Big Four" PBX's have proven their reliability and have done so at considerable savings to the State.

In 1983 an aggregate cost savings of $11 million to $20 million was projected over the 10-year useful life of the "Big Four" systems. Whereas first year total project savings was projected to range from $562,000 to $886,000, actual equipment savings for 1984 was approximately $736,000. Estimates for the next 9 years (remaining economic life of the equipment) can be found in Exhibit 1. Total project savings is now projected to be $18 million through 1993.

The "Big Four" project also included the establishment of a Network Control Center (NCC) in Helena. The NCC serves the State in three major ways:

- provides traffic engineering data to monitor STN usage.
- provides call accounting (telephone billing) of calling activity on the STN.
- provides remote diagnostics of STN PBXs.

More importantly the NCC provides the state with the information to optimize long-distance facilities for the STN, which translates into savings for state agencies. As a result of information from the NCC, orders have recently been

placed with Mountain Bell and AT&T to "fine tune" the STN. These changes will result in savings of approximately $7,000 per month at current tariffs.

Other Replacement Projects - 1983 and 1984

The installation of the "Big Four", and its satellite PBX's, has been followed by a series of telephone replacement projects that included new PBX's at the Warm Springs and Galen campuses of the State Hospital; the School for the Deaf and the Blind in Great Falls; and Cascade County Human Services in Great Falls. Several small key systems in many state offices have also been installed. A list of all replacement systems is outlined below:

LOCATION	AGENCY	EQUIPMENT TYPE
Billings	Eastern Montana College	SL-1 LE PBX
	Probation and Parole	Encore Key System
Bozeman	Montana State University	SL-1 XL PBX
Butte	Bureau of Mines and Geology	Omega Key System
Deer Lodge	Registrar's Office	Omega Key System
Dillon	Western Montana College	SL-1 LE PBX
Great Falls	Agricultural Extension	Omega Key System
	Highway Department	Omega Key System
	Highway Patrol	Omega Key System
	Job Service	Omega Key System
	Northern Montana College Extension	Omega Key System
	School for Deaf and Blind	SL-1 M PBX
	SRS-Cascade County Human Services	Mitel SX200 PBX
Hamilton	Job Service	Omega Key System
	SRS-Ravalli County Human Services	Omega Key System
Helena	Consumer Council	ITT1A2 Key System
	Department of Military Affairs, Armory	SL-1 MS PBX
	Department of Military Affairs, Fort Harrison	SL-1 M PBX
	Department of Natural Resources	SL-1 M PBX
	Department of Revenue, Liquor Warehouse	ITT1A2 Key System
	Department of State Lands, Forestry	Tie Key System
	Higher Education	SL-1 M PBX
	Highway Department	SL-1 LE PBX
	Justice Building	Horizon Hybrid Systems
	Mountain View School	Tie Key System
	Publications and Graphics	Omega Key System
	State Capitol Complex	SL-1 XL PBX
	Workers' Compensation Division	SL-1 M PBX
Kalispell	Agricultural Extension	ITT1A2 Key System
	National Guard Armory	ITT1A2 Key System
	SRS-Flathead County Human Services	Mitel SX200 PBX
Missoula	Department of State Lands, Forestry	SL-1 M PBX
	Department of Revenue	Omega Key System
	Life Skills Center	Tie Key System
	University of Montana	SL-1 XL PBX
Polson	Job Service	Tie 1A2 Key System

Virtually all of these replacements were found to save the respective agencies money when compared to leasing of its previous equipment. A major reason for those savings is fixed equipment costs.

Overall, during 1983 and 1984, 34 new phone systems were installed in state offices representing over 12,000 phones.

Future Replacement Projects - 1985 and 1986

Several other replacement projects are scheduled for 1985 and 1986. In addition to a number of small systems, two major projects include the State Prison in Deer Lodge and Northern Montana College in Havre. Under consideration for replacement are the Pine Hills School for Boys in Miles City and the Boulder River School, pending 1985 legislative action. Also, Montana College of Mineral Sciences and Technology in Butte is considering the purchase of its existing leased PBX.

A major on-going project is the community wide small system replacement project. The intent of this project is to systematically replace equipment, where appropriate, a community at a time. Helena was completed in 1984. Eleven separate agency offices in Billings will be bid in early 1985. After Billings, State offices in Missoula, Great Falls, Butte, Bozeman, Kalispell, and Havre will be evaluated on a community wide basis.

Telephone equipment replacements that cannot meet this schedule will be handled on a case-by-case basis. Whereas economies of scale can often be achieved if many systems can be bid at one time, many requests for new equipment require immediate response for agencies that are in the process of moving, remodelling or expanding.

In all replacement projects the State uses the competitive procurement process to acquire replacement equipment. This process has proven that the different telecommunications companies in Montana can provide adequate service at a low cost to the State.

TELEPHONE SYSTEMS COST SAVINGS
"BIG FOUR" REPLACEMENT PROJECT

LOCATION	ACTUAL 1984	PROJECTED NEXT 2 YRS	PROJECTED YRS 4-10	TOTAL
Eastern Montana College	($1,260)	($16,640)	$ 459,860	$ 441,960
Montana State University	85,590	102,720	2,339.280	2,525,590
University of Montana	112,920	205,910	2,436,950	2,755,780
Missoula Forester	(340)	(1,740)	43,290	41,210
State Capitol Complex	540,920	1,165,460	11,342,810	13,049,190
TOTAL PROJECT	$735,830	$1,455,710	$16,622,190	$18,813,730

ASSUMPTIONS:

1) New system maintenance charges were inflated 10% annually.

2) Replaced Centrex equipment costs were increased 10% annually.

3) Bell access charges were increased 15% annually.

4) Agency equipment payments are reduced to maintenance and access only in the 10th year.

January, 1985

EXHIBIT 1

STATE TELEPHONE NETWORK

In its simplest form, Montana's State Telephone Network (STN) is comprised of three types of facilities:

1. TELPAK point-to-point circuits (eg. Helena to Missoula)
2. WATS circuits (Wide Area Telephone Service)
3. DDD circuits (Direct Distance Dialing)

All three of these circuit types have historically been provided by Mountain Bell. During 1983 and 1984 a series of MAJOR changes took place that have had a serious impact on the low cost operation of the STN:

A. All three circuit types were divided between Mountain Bell and AT&T in 1984 as a result of the AT&T divestiture.
B. TELPAK Point-to-Point circuit costs increased 46% in 1983 and 32% in 1984.
C. WATS circuits became "usage" measured (versus bulk billed) in 1983.
D. AT&T filed for the elimination of its TELPAK circuits in 1983.

Combined, these factors have increased the cost of providing the STN by more than 60% over the 1982 rates. To further complicate the issues, network usage continues its upward trend and the demand for high speed data grows and grows.

To counteract these factors and to address the long-term direction for network services, the State has taken the following steps:

- Reconfigured the STN.
- Intervened against the elimination of TELPAK.
- Established an Advisory Council to assist the State in long-term direction issues.
- Began the preparation of a bid for short-term (2-3 years) network services.

Each of these is addressed separately below.

STN Reconfiguration

Prior to the "Big Four" telephone switch replacement project, the STN was a "Star-Hub" arrangement, which utilized Helena as the "Hub" of the network. That is, a call originating from a network community other than Helena was first routed to Helena and then onward to its destination. This inefficient usage of the network was eliminated when the STN was reconfigured during the 1983 "Big Four" project (see Exhibit 2).

The STN utilizes Electronic Switched Network (ESN) software. ESN provides alternate routing for long-distance calling and allows flexibility in network design. Additional ESN benefits include:

1. Centralized management control of long-distance facilities.
2. Overall telecommunications cost reductions through more efficient use of STN facilities.

3. Increased reliability of communications facilities.
4. Simplified maintenance and administration of facilities.

TELPAK Rate Case Intervention

In November, 1983, AT&T Communications filed with the Montana Public Service Commission (PSC) to eliminate the State's TELPAK tariff effective January, 1985. The Department of Administration formally filed intervention testimony in September 1984.

TELPAK, a bulk discount offered to large users, has been the backbone of the STN since 1975. Known as "the last good deal in telecommunications", TELPAK rates have historically been low and stable until 1982 when a 46% increase was granted by the PSC (effective in January of 1983). Much has happened to the tariff since that time, (see Exhibit 3). Even with these dramatic increases, TELPAK remains less expensive compared to the regular tariff for comparable service.

Rate case intervention formally presents to the PSC the State's case against pending network cost increases, and can help minimize current networks costs.

Telecommunications Policy Advisory Council

In August, 1984 the Department of Administration appointed a Telecommunications Policy Advisory Council (TPAC) to assist with an overall broad-based review of the telecommunications issues facing the State and to aid in making policy and strategic direction recommendations. The Department does have statutory responsibility to assess the overall telecommunications needs of state government, and to establish definitive telecommunications policy and strategic direction. However, as a result of the far reaching cost and service consequences of telecommunications direction and policy decisions, the Department solicited the advice of the Council.

The objectives of the Council were to:

1. Identify and assess the needs related to data and voice communications of state government agencies, the university system, local governments and other political subdivisions.

2. Define the scope of network services. Who should the Department of Administration serve? What services should be provided?

3. Review the use of current telecommunications services by the State and the future of those services.

4. Review the costs of current network services and where those costs are going.

5. Review the alternatives facing the State and make recommendations on the directions and action to be taken.

After exposure to the numerous network user needs and presentations by the Department and various members of the vendor community, the Council made recommendations addressing short-term and long-term issues.

Long-Term TPAC Recommendations

1. That the Governor establish a Telecommunications Advisory Council for the 1986-87 biennium to interact with the Department of Administration in addressing the long-term telecommunications direction of the State.

2. That the Department of Administration be empowered to seek appropriations from the 1985 Legislature to contract with an outside telecommunications consultant to work with the above Advisory Council and the Department to:

   - o Conduct a detailed identification, assessment and analysis of network needs.
   - o Design network alternatives to address the needs.
   - o Assist in preparation of documents to solicit alternative network proposals for solutions.
   - o Assist in evaluation of network proposals.
   - o Assist in preparation of recommendations to be presented with the Advisory Council to the 1987 Legislature.

Short-Term RFP

While the TPAC concurred that 1985 and 1986 should be used to accomplish the long-term recommendations, some immediate action should be taken to stabilize network costs. As a result, the TPAC recommended that the Department proceed immediately with a Request for Proposals (RFP) for short-term agreements for STN facilities. These agreements should be 2-3 years in duration and must be renewable annually.

Mountain Bell and AT&T have expressed to the State and the TPAC a willingness to enter into such agreements. The benefits of short term agreements will be to fix short-term rates by moving them away from the regulatory arena, provide improved flexibility for STN growth and offer alternatives to TELPAK in the event of its elimination.

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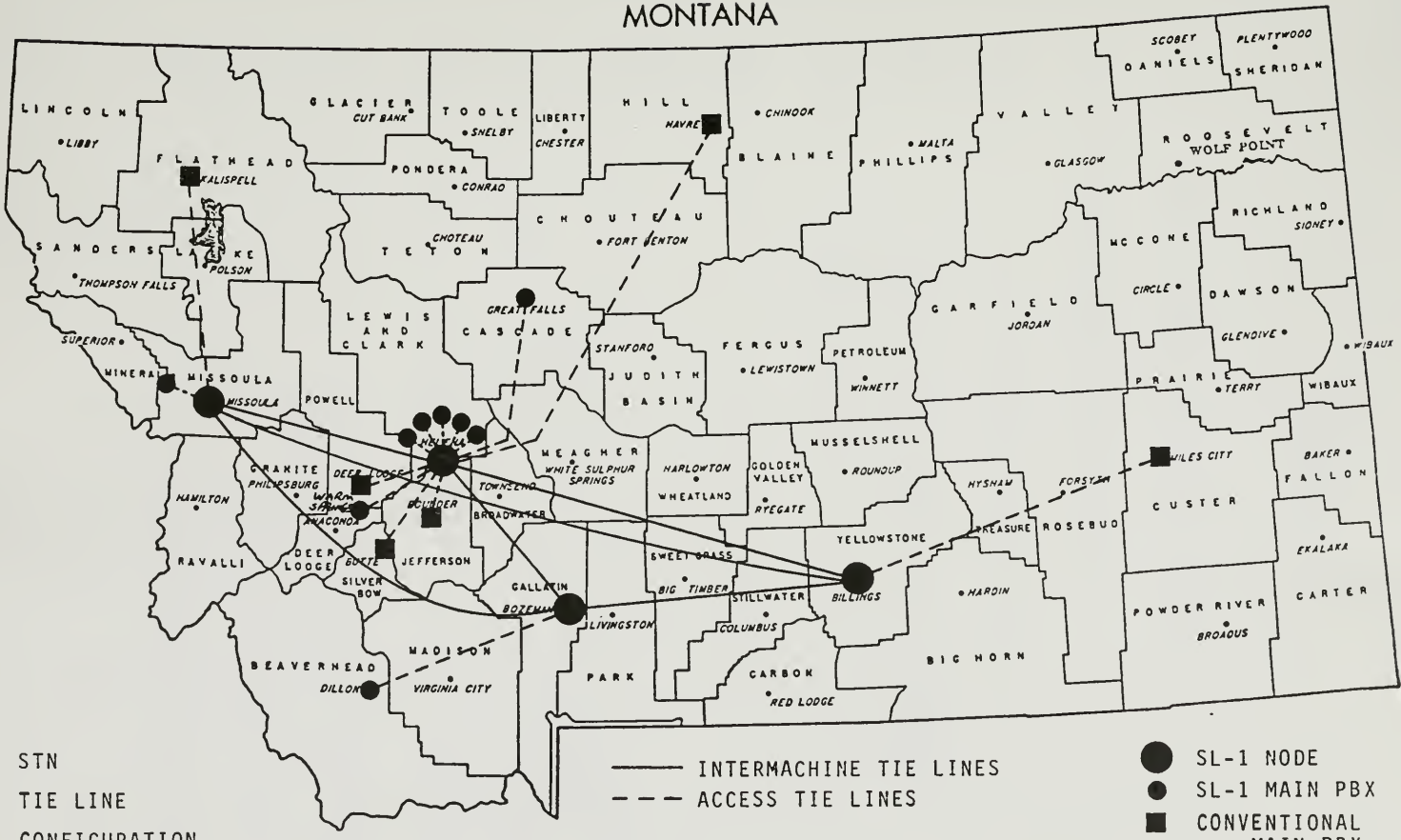


STN
TIE LINE
CONFIGURATION

EXHIBIT 2
JAN 85

——— INTERMACHINE TIE LINES
– – – ACCESS TIE LINES

● SL-1 NODE
● SL-1 MAIN PBX
■ CONVENTIONAL MAIN PBX

CHRONOLOGY OF EVENTS
RELATING TO
THE TELPAK TARIFF

1980------18.8% rate increase, effective in early 1981.

1981----------Tariff offering was "grandfathered".

1982----------Bell requested 53.3% rate increase.
February

1982----------Letter received from Bell warning of possible
December elimination of the TELPAK tariff in early 1984.

1982----------PSC ruled on February rate request and granted
December Bell a 46% rate increase.

1983----------46% rate increase became effective.
January

1983----------Bell requested 16.8% rate increase.
March

1983----------As part of the 1/1/84 divestiture, AT&T requested an
November interim TELPAK tariff with a 20% rate increase and
elimination of the offering effective 1/1/85.

1983----------PSC granted AT&T an interim tariff with a 15% rate
December increase.

1983----------PSC ruled on the March rate request and granted Bell
December a 4% rate increase.

1984----------Divestiture split the TELPAK tariff into one
January offering by Mountain Bell and another by AT&T
Communications.

1984----------15% AT&T and 4% Mountain Bell rate increases
January became effective.

1984----------AT&T granted an additional interim rate increase
May of 17.1%

EXHIBIT 3

DATA COMMUNICATIONS NETWORK

Montana's Data Telecommunications Network (DCN) provides long distance data circuits to State offices throughout the State. The DCN is comprised of point-to-point circuits leased from Mountain Bell and AT&T. Many of these point-to-point circuits are available under the same TELPAK tariff used for the State Telephone Network (STN).

Like the STN, the cost of providing the DCN circuits is now 60% higher than the same circuit cost in 1982. Similarly, the pending elimination the AT&T TELPAK tariff could further increase these circuit costs.

In addition to rising costs, the demand for data communications is increasing at a drastic rate. The DCN has grown from a handful of terminals in 1975 to more than 1,000 today. The ratio of information workers to workstations has changed from 50:1 in 1970 to 20:1 in 1980, and is projected to be 1:1 by 1990. Considering the magnitude of future demand the DCN will need to grow 25% - 35% annually.

The major issue to be considered by the new Advisory Council on Telecommunications (see page 8) is the complexity of the future data communications environment in the State. Any network alternatives defined in the future must consider the requirements for high-speed digital data transfer needed to better position the State to deal effectively with the impact of the "Information Age".

To address the increasing pressures of cost and technical growth in data communications, the Information Services Division plans to implement the following projects during 1985 and 1986.

1. Redesign the DCN to incorporate the Law Enforcement Network and provide data access points at statewide locations.

2. Convert Capitol complex terminals to local access hookup.

3. Enhance dial-up security.

4. Coordinate asynchronous multiple host networking capability among the universities.

5. Consolidate all data communications expenditures through the Telecommunications Bureau Revolving Account.

Each of these projects is addressed in detail below.

DCN Reconfiguration

The single most important undertaking in teleprocessing during the next few years is the consolidation of the DCN with the Department of Justice data communications network. The 1983 Legislature authorized the Department of Justice to replace its aging System/7 message switching system. The DOJ opted

for a mainframe switching system with their computer terminals attached to the DCN.

In the summer of this year, the DCN will expand from 35 separate sites in 17 cities to over 105 sites in 53 cities. The total leased line network miles will probably more than double. Redesigning the DCN provides inexpensive network access points at convenient locations across Montana, and minimizes costs.

The most glaring problems considered in the redesign of the DCN is contending with the growth. This growth is in terms of number of terminals, sites, and lines, which is reflected in total communications circuit charges. Data circuit growth is projected to be 25-35% per year in addition to a doubling of terminals (see Exhibit 4).

A solution to this problem is to use higher speed multiplexing technology to increase the capacity of existing circuits. By placing intelligent processing capability in strategic locations, the costs of circuits can be reduced significantly. Furthermore, these circuits may be shared between voice and data in the future, which can lead to further savings. With these factors in mind the following communities have been selected as ideal locations for data concentrators:

- Billings
- Great Falls
- Missoula

Exhibit 5 shows the proposed equipment locations and the network configuration.

Capitol Complex Local Coax

When the Capitol Complex phone system was installed in 1983, coaxial cable was also installed between the major buildings in the complex. The purpose of this cable is to 1) provide local terminal attachment, and 2) provide a backbone for future Local Area Networking.

The department will actively pursue the conversion to local attachment of terminals. The benefit of this will be a reduction in local loop charges.

Enhance Dial-up Security

The current dial-up access to ISD's computer facility is limited to 2% of ISD's users. The security threat posed by allowing access through these channels is minimal. This is due to restrictive nature of the IBM system (both hardware and software), and the implementation of the security software ACF2 (Access Control Facility).

The current trend is to open the host computer facility to a wider user base. The IBM system restrictions will be relaxed to accommodate use by ASCII terminal users. The system may become more vulnerable to abuse in the future. To reduce the security risk this trend represents, ISD will investigate and

make recommendations to protect the mainframe from unauthorized dial-up access.

Asynchronous System Network

The major computing activities in the State of Montana are centered in Helena and the university campuses. At present, there is no facility that allows communications between the DEC mainframes at the university campuses. There are limited communications between the campuses and the IBM host in Helena. This lack of data transfer capability poses many problems to the universities. Foremost, the universities cannot currently share their computing resources. Software expenditures run in the tens of thousands of dollars, and there is the potential to minimize the purchase of duplicate software if a high-speed intercampus data link were provided.

One solution under review is the sharing of currently leased communication facilities available between each campus and the host computer facility in Helena (for SBAS data entry). These lines could be shared (multiplexed) and used to form the heart of a inter-University communication network. By placing intelligent switching equipment at each University campus and in Helena, all the campuses could be linked together. Data files could be readily exchanged, excess capacity could be shared and access to specialized software could be realized. Appropriations to fund this project have been requested for the FY86-87 biennium.

Consolidate Expenditures

Currently, many agencies pay the costs of data circuits directly. As a result of this it is often difficult to estimate accurate statewide expenditures. Consequently, the Department has requested spending authority for the consolidation of these expenditures through the Telecommunications Bureau Revolving Account.

DATA COMMUNICATIONS TERMINALS

INSTALLATIONS FROM 1976 - 1988

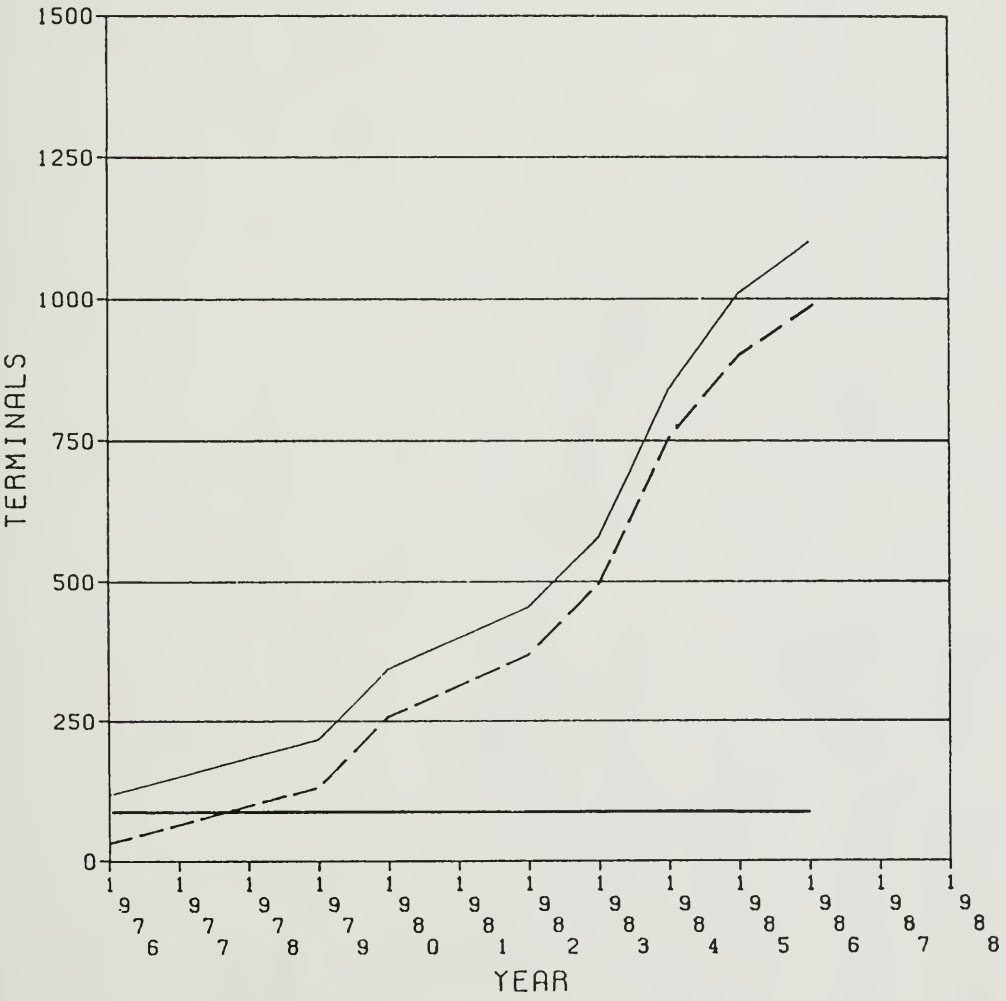
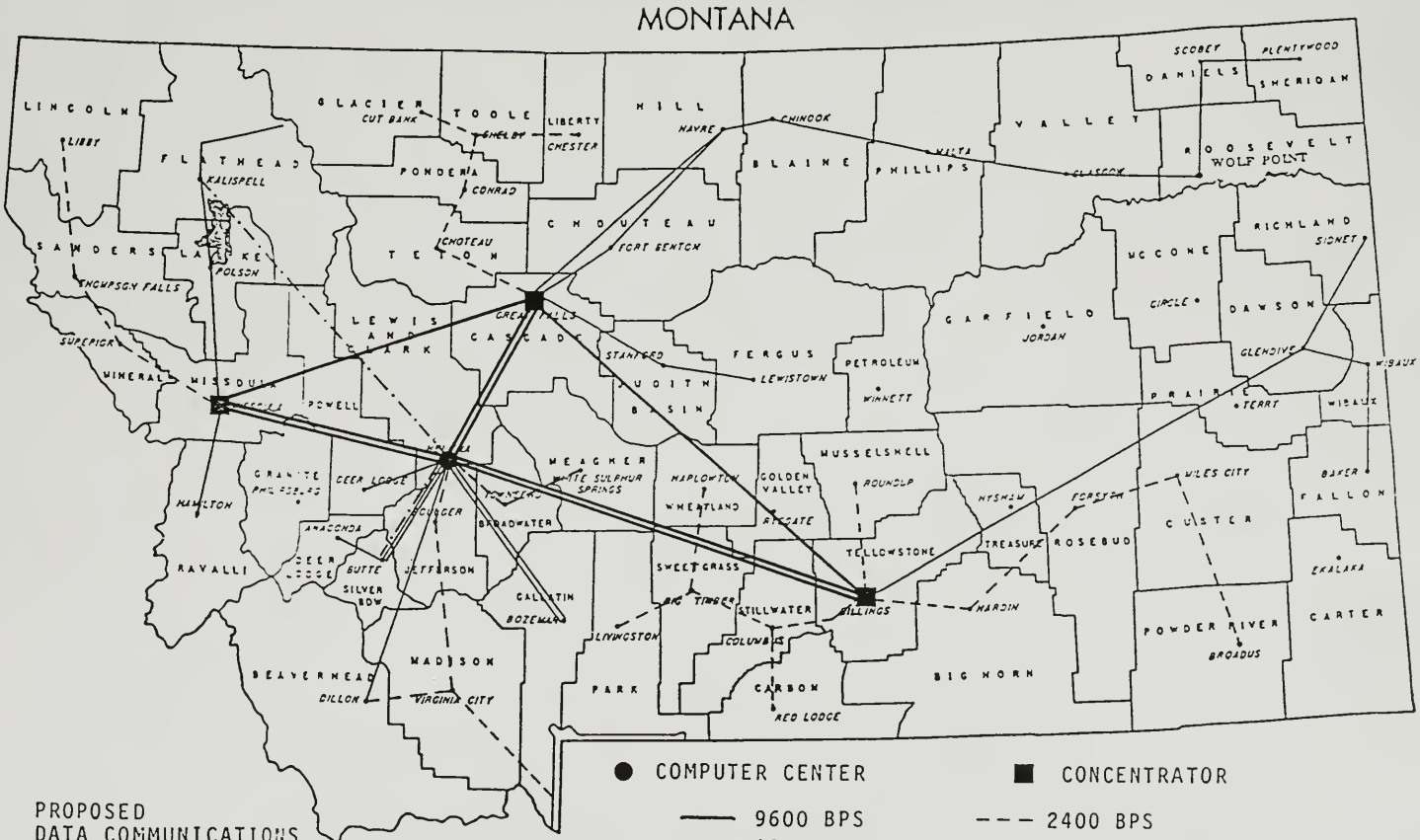


EXHIBIT 4



PROPOSED
DATA COMMUNICATIONS
NETWORK

December 1984

EXHIBIT 5

PUBLIC SAFETY COMMUNICATIONS PLANNING

In 1983 and 1984, Montana made steady progress in the area of land-mobile radio communications. During that time, several state and local agencies converted their radio systems from low-band frequency to high-band frequency equipment. State agencies' plans and budgets project a continuation of high-band frequency conversion. The Highway Patrol, the Highway Department, and the Fire Suppression Bureau projects are the major conversion projects for the next biennium.

Frequency utilization planning has progressed with a new Statewide Frequency Plan and a Continuous Tone Coded Squelch Signaling Plan. A Dual Tone Multi-Frequency (DTMF) Plan for emergency medical services agencies has been kept up to date and in place.

The Statewide Mutual Aid Frequencies Program has continued to evolve with the use of 154.070 (Fire) and 153.905 (Inter-governmental/Inter-agency) now permitted in base stations, as well as portables. A Mutual Aid User's Handbook and Directory is currently being developed to identify all mutual aid frequency users.

During the biennium the Land Mobile Radio Users' Advisory Council has met six times to discuss needs and develop plans for two-way radio users throughout the state. This council has reviewed and commented on all aspects of frequency utilization during the last eighteen months.

The frequency usage database has been computerized making frequency coordination more accurate and less time consuming. The Telecommunications Bureau also has the capability now to run intermodulation programs to evaluate the compatibility of multiple frequencies at one site.

State Agency High-Band Conversions

The 1983 Legislature authorized all state agency radio users to begin converting to the high-band frequency spectrum during FY 84 and 85. Due to system size and available resources, the Department of Highways and the Highway Patrol planned on a four-year transition. Highway and Highway Patrol plans have featured maximum site sharing and coordination among other participating departments. These major systems promote statewide interagency communications through access to statewide mutual aid channels.

Essential to the success of conversion is the direction in which local agencies, primarily county sheriffs and municipal police departments, move in adopting similar conversions. A proposal for state financial support for conversion for local agencies was made to the 1983 Legislature, but was not approved. The alternative is for local agencies to make the transition using available local resources.

An examination of the trend in local government indicates that conversion to high-band is accelerating (see Exhibit 6). At the present time, 16 county sheriff departments operate high-band or a combination of high and low-band systems, while 7 are now planning to convert to high-band. Most police

departments are low-band. All ambulances and hospitals are high-band, and 72% of the fire departments are high-band. It is now estimated that full local government conversion to high-band would cost approximately $5.5 million (see Exhibit 7).

Interim measures to assure interagency communications are required during conversion. Agencies converting to high-band, but requiring communications with local low-band users continue to carry both low and high-band equipment in mobile vehicles. Low-band equipment can be phased out as more local agencies convert to high-band. In cases where state field personnel must exclusively or primarily deal with local agencies on low-band, new low-band equipment must be purchased, if required by lack of available equipment or equipment which is obsolete or inadequate.

The basic assumption during high-band conversion is that as state agencies convert and as local agencies realize the benefits of high-band, a statewide conversion to high-band will take place. To help this effort along, and to improve interagency communications in the interim, the Telecommunications Bureau will research the effectiveness of co-locating state owned high-band base stations with locally owned low-band equipment at strategic locations. By cross patching these systems, communications may be improved as total high-band conversion takes place.

During FY 84 and 85 $1,900,000 was budgeted for State conversion projects and other land-mobile radio expenditures. FY 86 and 87 state agency budget requests (pre-executive planning process) total to $2,344,242. Appendix A itemizes these requests by Department.

Frequency Coordination

Frequency assignments are based on information made available from the requests for frequency coordination, and user/vendor input. Frequency coordination or an engineering study is required by Federal Communications Commission Rules as part of the application process. (Section 90.175 Frequency Coordination Requirements).

During 1983 and 1984, the Telecommunications Bureau coordinated over 350 frequency applications for state and local government users.

Frequencies are assigned to reduce interference and to make the most effective use of the available spectrum. Stations receiving or causing harmful interference are expected to cooperate and resolve problems by mutually satisfactory arrangements. If the licensees are unable to do so, the Federal Communications Commission may impose restrictions including specifying the transmitter power, antenna height, hours of operation, or area of operation of the stations concerned.

During 1983 and 1984 a computer database has been established that provides for more accurate and less time consuming frequency coordination. It has been invaluable by more quickly responding to numerous and various questions concerning interference, licensing and planning.

Similarly, a program has been developed which can detect the possibility of intermodulation interference occurring among a specific group of frequencies present at one site or in close proximity to one another. This aids in choosing frequencies as well as sites for radio systems.

Overall, high-band frequency coordination has been progressing smoothly with few interference problems. Cooperation among radio user and sound engineering continue to be the key to successful frequency utilization.

Detailed procedures relating to frequency coordination have been developed by the Telecommunications Bureau. Specific information about frequency coordination may be found in Appendix B.

Mutual Aid Frequency Development

The adoption of statewide high-band mutual aid frequencies make it possible for any agency to talk with any other on the high-band frequency spectrum. Many agencies, because of the scarcity of personnel and the need for coordination of resources, find combined efforts via radio communications to be of value. Fish and Game Wardens, for example, can assist in a variety of law enforcement emergencies in addition to their normal duties.

The State of Montana has been authorized by the Federal Communications Commission to operate four mutual aid radio networks to provide common channel access to all public agencies in Montana. These four network frequencies are 153.905 MHz, 154.070 MHz, 155.475 MHz, and 155.790 MHz. All users of these frequencies must receive a permit from the Telecommunications Bureau, Information Services Division, Department of Administration. Other frequencies are designated as specific use or mutual aid frequencies. These are 155.280 MHz, 155.325 MHz, 155.340 MHz, and 155.385 MHz for Emergency Medical Services; and 155.160 MHz and 155.220 MHz for Search and Rescue.

A Mutual Aid Directory and Handbook is being developed by the Telecommunications Bureau and will be availble for distribution in early 1985. General contents of this directory will include:

- purpose of mutual aid frequencies.
- list of the frequencies currently licensed to the Department of Administration.
- description and nature of use of each frequency.
- policies governing use.
- procedures for procuring State Permits for authorization of use.
- directory of agencies statewide that have entered into cooperative agreements to use the mutual aid frequencies.
- individual user call signs and identifiers.

Appendix B, Land Mobile Radio Frequencies, Policies and Procedures, defines the rules and regulations for application and use of Montana Mutual Aid frequencies.

Other Public Safety Communications Projects

9-1-1

Since 1968, the federal government and telephone companies have recognized "9-1-1" as the universal emergency assistance telephone number. In 9-1-1 systems, a caller needing help may reach a Public Safety Answering Point from which help is directly dispatched or dispatched through a relay system. Many states outside of Montana use the 9-1-1 system.

9-1-1 legislation will be addressed by the 1985 Montana Legislature. If this legislation passes, the Department of Administration, will be the overall coordinating agency in assisting in the development and implementation of local 9-1-1 systems throughout the state.

Surplus Low-Band Radio Equipment

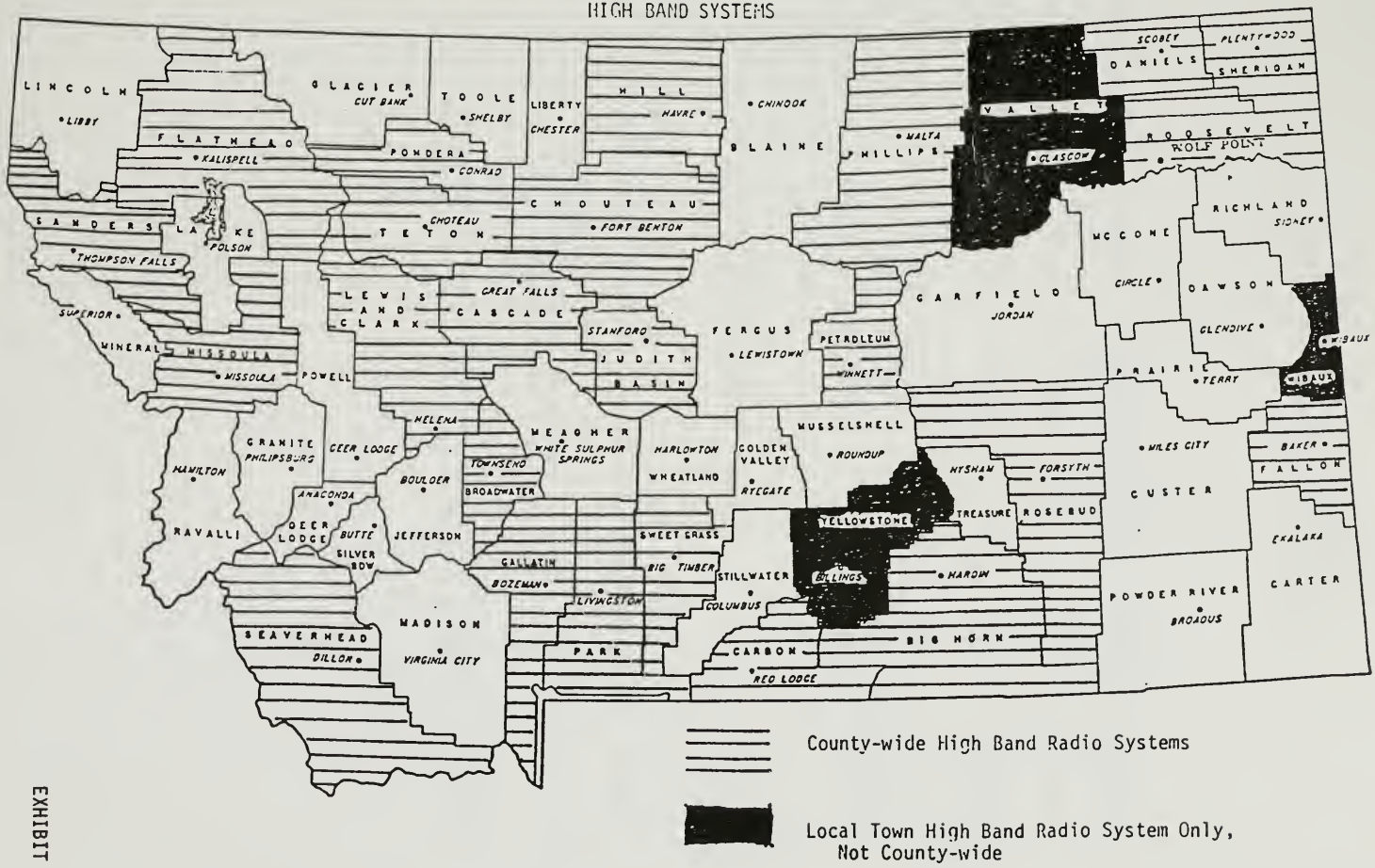
As local governments and state agencies convert from low-band radio frequencies to the high-band spectrum, some state agencies will be left with surplus low-band equipment. During 1985, the Telecommunications Bureau will design a system whereby surplus low-band radios may be made available to other agencies.

State and Local Government Coordination

As State and local governments proceed with their individual plans in public safety communication areas, coordination between the various parties become more and more important. The Telecommunications Bureau will work with all entities to help ensure coordination to improve the effectiveness of the systems being implemented.

LOCAL LAW ENFORCEMENT

HIGH BAND SYSTEMS



County-wide High Band Radio Systems

Local Town High Band Radio System Only, Not County-wide

EXHIBIT 6

ESTIMATED COSTS OF HIGH BAND CONVERSION FOR LOCAL GOVERNMENT AGENCIES

RADIO SERVICE	MOBILES	BASE STATIONS	CONTROL STATIONS	MOBILE RELAYS	PORTABLES
Police (all local law enf)	1,750 $2,450,000	140 $322,000	30 $69,000	30 $66,000	450 $405,000
Local Government	610 $ 854,000	30 $ 69,000	5 $11,500		50 $ 45,000
Special Emergency	240 $ 336,000	30 $ 69,000	5 $11,500		25 $ 22,500
Equipment Subtotal	2,600 $3,640,000	200 $460,000	35 $80,500	30 $66,000	525 $472,500
Installation (17%)	$ 802,230				
	TOTAL CONVERSION COSTS		$5,521,230		

NOTES:

1) Equipment prices taken from the State Term Contract T.C. 897-85-A:

   - mobiles @ $1,400 each
   - base/control @ $2,300 each
   - mobile relays @ $2,200 each
   - portables @ $900 each

2) These figures represent the conversion of all equipment (low-band) currently found in the State's user license database.

EXHIBIT 7

APPENDIX A

LAND MOBILE RADIO PROGRAMS FY86-87

COST SUMMARY

Department	Radio Equipment	Personnel and Operating Expenses
Administration		2,160.00
Commerce	10,000.00	4,780.00
Fish, Wildlife & Parks	7,200.00	
Governor's Office	4,000.00	
Highways	799,534.00	60,000.00
Historical Society		720.00
Institutions	24,270.00	28,080.00
Justice	500,249.00	655,021.00
Livestock	4,400.00	10,026.00
Lands	95,390.00	83,210.00
Military Affairs	13,000.00	8,000.00
Public Service Commission	2,000.00	1,150.00
Revenue		452.00
University System	30,600.00	
Subtotals	$1,490,643.00	$ 853,599.00
Biennium Total		$2,344,242.00

Department of Administration

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals	$1,080.00	$1,080.00	$2,160.00
Installation & Maintenance			
Equipment Purchases			
		Total	$2,160.00

The Department of Administration rents a paging answering service for $90 per month to contact computer technicians after regular hours and over the weekend.

Department of Commerce

Aeronautics Division

	F.Y.'86	F.Y.'87	total
F.T.E.'s			
Rentals	$ 390.00	$ 390.00	$ 780.00
Installation & Maintenance	$2,000.000	$2,000.00	$ 4,000.00
Equipment Purchases:			
20 air-to-ground transceivers	$5,000.00	$5,000.00	$10,000.00
		Total	$14,780.00

The $5,000 in F.Y.'86 and F.Y.'87 for air-to-ground transceivers is a matching fund for monies from local communities on a 50/50 basis. It is budgeted for air-to-ground transceivers at $1,000 apiece. These transceivers (base stations) will be used to replace old equipment; while some are for new stations depending on community demand.

The rental request is for a paging answering service through Capital Answering Service.

Department of Fish, Wildlife and Parks

Parks Division

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
6 mobile radios	$7,200.00		$7,200.00
		Total	$7,200.00

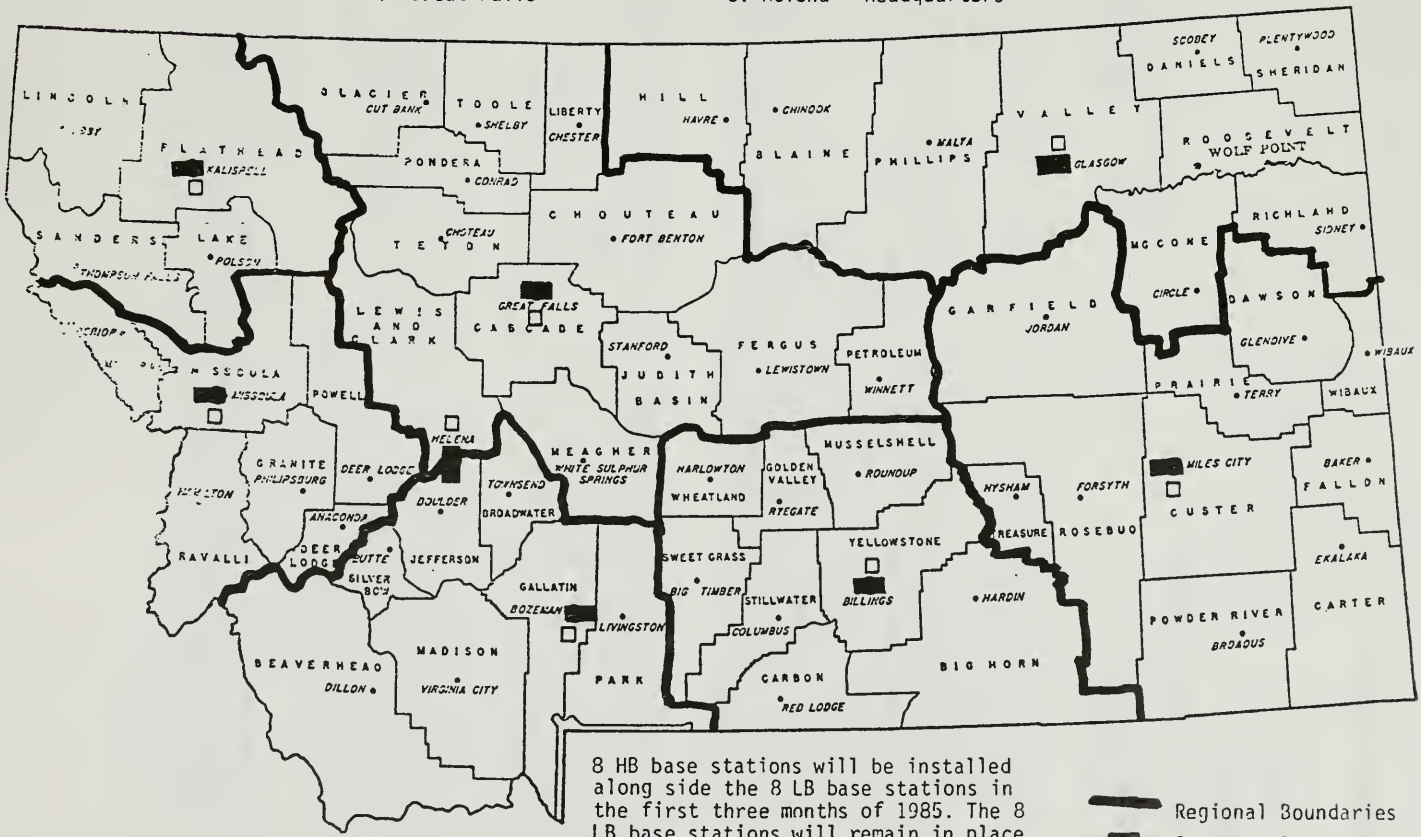
The Parks Division is the only F,W & P division reporting equipment requests during the next biennium. Maintenance funds are drawn from within each division's operational budget if needed. The Law Enforcement Division will purchase eight base stations, ten mobiles and ten portables in FY85 to finish their conversion to high-band.

FISH, WILDLIFE AND PARKS LAND/MOBILE SYSTEM

Fish, Wildlife and Parks Regions

1. Kalispell
2. Missoula
3. Bozeman
4. Great Falls
5. Billings
6. Glasgow
7. Miles City
8. Helena - Headquarters

December 1984



8 HB base stations will be installed along side the 8 LB base stations in the first three months of 1985. The 8 LB base stations will remain in place and in use.

Regional Boundaries

Current LB Base Stations

Proposed HB Base Stations

Governor's Office

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases	$2,000.00	$2,000.00	$4,000.00
		Total	$4,000.00

The Governor's Office has budgeted $4,000 over the next biennium for purchase of new equipment.

The Governor has a critical need to be able to receive communications at all times. He establishes communications, while out of the Helena area, through various public safety agencies (local law enforcement, Highway Patrol, etc.). The two-way radio system is intended for use when a telephone is unavailable, or when law enforcement entities need to be reached.

The Governor's current two-way radio system enables reception of signals, but because of its low power, cannot be used to transmit long distances. This is particularly critical when the Governor is at an isolated location without telephone service, such as at an outdoor event or en route to a location via automobile.

The proposed system provides for amplifiers and antennas which will extend both reception and transmission in the automobile. This proposed system approximately doubles reception while in the automobile and increases transmission from approximately 5 to 45 miles. Conditions, such as poor weather, terrain and atmosphere may adversely affect reception and transmission. The tuned heliflex antenna, attached to the portables while away from the automobile, will improve reception to some degree.

Use of both low-band and high-band radios is recommended. Most counties have low-band base stations in use. However, some counties have abandoned low-band for high-band. The Governor will be provided with lists of available frequencies throughout the State, but it is also recommended that the Governor communicate with local and state law enforcement regarding his radio communications system so that these agencies will be prepared to interact with the Governor through appropriate radio bands.

The proposed system enables reception of a signal at a remote location while away from the automobile. Upon receiving a message, the Governor or a staff person would return to the car to transmit a message if the portable away from the car is unable to reach the party to be called. Portables do have basic limitations, but this system would be a significant improvement over the existing system.

Department of Highways

	F.Y.'86	F.Y.'87	Total
F.T.E.'s	11	11	
	$ 5,000.00	$ 5,000.00	$ 10,000.00
	$ 22,000.00	$ 22,000.00	$ 44,000.00
Rentals	$ 3,000.00	$ 3,000.00	$ 6,000.00
Installation and Maintenance			
Equipment Purchases	$419,768.00	$379,766.00	$799,534.00
		Total	$859,534.00

The $799,534 for equipment purchases is for inventoriable items only. The eleven F.T.E.'s represents one more than current level. The $10,000 is for overtime pay for personnel. The $44,000 is for one additional technician that will increase F.T.E. requirement to 11. Vehicle rentals account for the $6,000.

The Department of Highways has just finished converting the Glendive District. The Wolf Point District is yet to be converted from low-band to high-band. This Highways system of high-band regional base stations and mobile relays will be shared with other non-law enforcement state agencies and will provide for regional dispatching capabilities. Conversion to high-band in eastern Montana should be completed in the summer of 1985. Western Montana will be converted in F.Y.'86 and F.Y.'87, thus the budget request of $780,000.

The Department of Highways will also share their mobile relay sites with local communities to minimize costs at the local level.

Department of Highways
High-Band Conversion - Phase One
Current status through FY85

The 1983 Legislature approved appropriations, for the first half of the Departments high-band conversion in the following amounts:

FY 84	399,337
FY 85	399,266
Biennium Total	798,603

This amount was originally projected to complete installation of the Great Falls Division which was the original pilot study area and totally convert the Havre, Miles City, Glendive, Wolf Point, and Lewistown Divisions and partially complete the Billings Division.

Currently Great Falls, Havre, Miles City and Glendive Divisions are complete with the exception of a few local bases to be installed in select section shops. The Wolf Point mobile relays and the antenna system of the main base/control stations along with a few mobile relays have been installed. All of the equipment for the Lewistown and Billings Divisions has been received or ordered at this time. All equipment for the GVW section (mobiles and scale house bases) is currently being ordered for the above divisions.

Present status of expenditures leave approximately $235,000 as of December 1, 1984. Current equipment orders reduce this figure to approximately $106,000. Of this figure most will be allotted to the equipment to supply the needs of the GVW section and some of the local section shop bases.

The current balance will probably take this conversion phase further than originally projected allowing complete installation of the Billings Division prior to July 1, 1985.

The remaining Divisions of this phase are projected to be completed as follows:

Wolf Point	5-1-85
Lewistown/Billings	7-1-85

Notes:

A. The current methods of converting individual divisions base systems evolved greatly from the first divisions. Rather than completely change a division within a short period of approximately two weeks, Highways currently installs the mobile relays and select mobiles allowing these few units to become accustomed to the operating characteristics of the system for an extended time period. This also allows them to determine the effectiveness of the existing mobile relay locations and their coverage before committing to final removal of the low-band radios and installing the main control/base radio and all other mobiles.

B. All sites have been used on a shared basis where possible with the Highway Patrol. Highways personnel have assisted in the installation of several sites.

The Highways Department is planning on connecting their systems to the Highway Patrol dispatch centers when they become operational. This will enable better direct communications between the agencies and will provide possible year-round 24 hour monitoring of the Highway systems.

C. The Department has been including means by which each District headquarters office also will be able to access and control the outlying Division(s) radio system. This eliminates the need for additional personnel to monitor the radio system and collect road condition data after hours and on weekends. So far this appears to be very cost effective.

D. The Department airplane will soon be equipped with a radio capable of operating on all Highway and Highway Patrol channels. More Motor Pool cars will soon be equipped with the new radios. Planning & Survey's two Helena based units have been equipped with radios.

E. An emergency portable mobile relay unit has been assembled and is available for emergency replacement of any Highway or Patrol mobile relay unit which may fail. This unit is only the size of two shoe boxes and is capable of operation on battery backup and solar operation if necessary. This unit would also be capable of enhancing operation in emergencies where spot communications is required to extend coverage quickly and easily. This unit also greatly aids the survey of potential radio sites for determination of coverage.

F. An operational manual including station locations, channel & tone access combinations and operating protocols is currently being assembled and should be available along with the next "Call Book" for distribution in early spring.

Department of Highways
High-Band Operation Outline

The high-band conversion at this point seems to have been quite successful. Although a change of this magnitude is sure to be full of bugs, they have not been insurmountable. The Department has had to stop and evaluate the systems several times and make some changes. The overall design of the systems has been flexible enough to accommodate this.

All new division base/control radios are being designed using standard factory parts. They are engineered in-house as no vendor provides the multiple function capabilities which are required for operations. These units are engineered to be controlled remotely using any commonly available resource such as normal voice grade telephone circuits, standard radio links, and microwave or a multiple of these carriers. There are typically six functions available within each unit. These functions include: The statewide general base to base (mobile) channel, the individual division channel direct base to mobile, three separate localized mobile relays, and the old low-band radio. The low-band function will be phased out giving a spare function.

The most notable achievement of the new systems seems to be the super-extended range within localized areas between vehicles via the mobile relays. This feature provides the heart of the design.

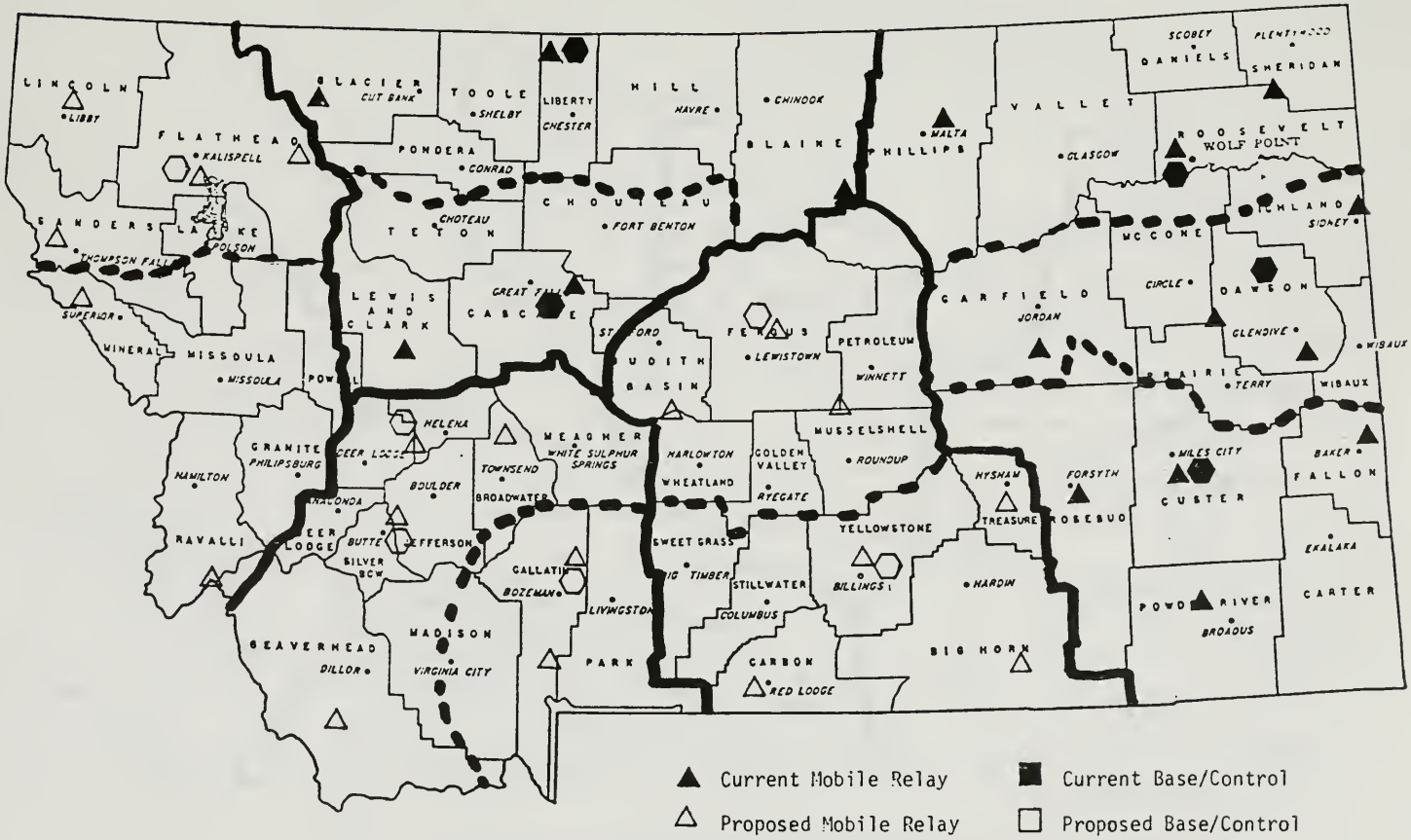
The use of a "mobile only" frequency provides a much needed short range direct connection between mobiles which does not interfere with other base to mobile communications. This channel is common statewide.

The common mutual aid channel has not been used between agencies too extensively, but has been there when necessary. Originally in the older style radios of the Great Falls division, range was extremely short due to the narrow band-width of the radios. Through special tuning procedures, this effect is being greatly minimized. The new radios installed in subsequent division have not been plagued with this problem.

The ability to utilize multiple frequencies and tones to give localized coverage to the division offices is very valuable.

The District headquarters are being equipped to control the other divisions within their district. They are able to control the complete radio system, remotely record local road information to the distant division's local road report answering machines and through a line transfer device receive the local calls directly to the District headquarters after hours. This eliminates up to 1 FTE per outlying division. (Winter radio/phone monitoring position.)

DEPARTMENT OF HIGHWAYS CURRENT AND PROPOSED HIGH BAND CONVERSION PLANS



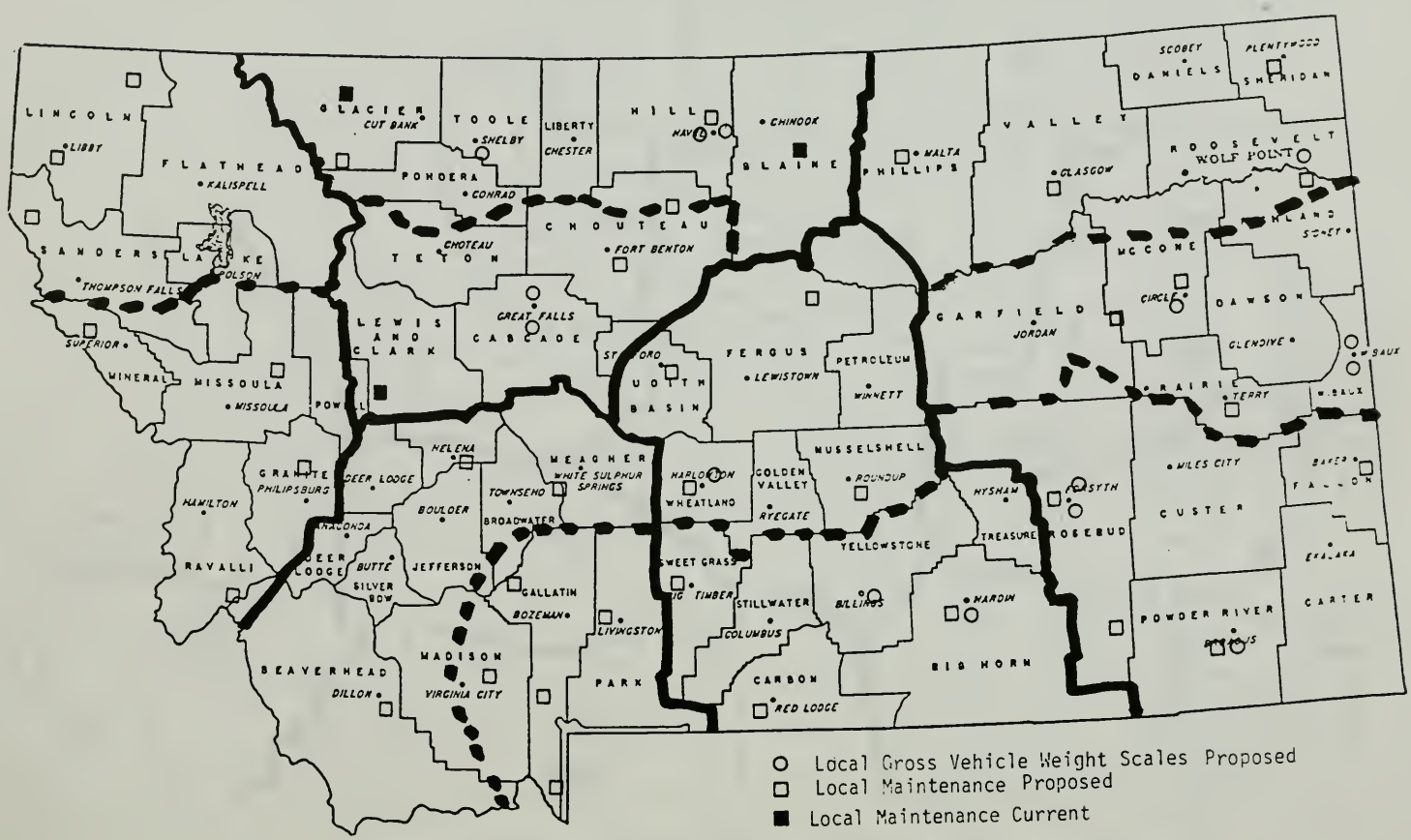
▲ Current Mobile Relay ■ Current Base/Control

△ Proposed Mobile Relay □ Proposed Base/Control

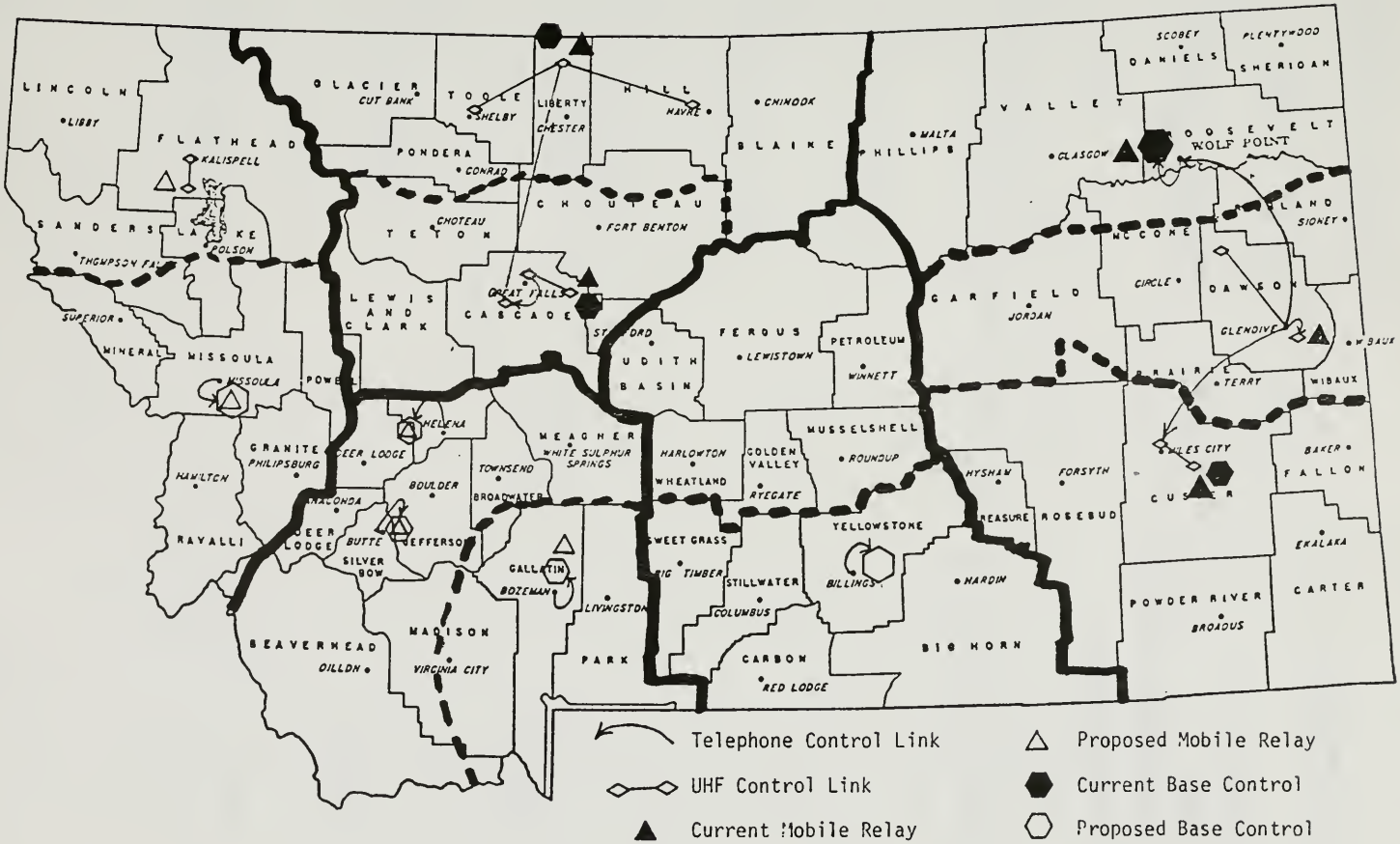
The Bozeman, Butte, Missoula, and Kalispell Divisions are planned for High Band conversion in F.Y.'s '86-'87.

The Lewistown and Billings Divisions are planned for High Band conversion by June 30, 1985.

DEPARTMENT OF HIGHWAYS LOW POWER LOCAL CONTROL BASES



DEPARTMENT OF HIGHWAYS UHF AND TELEPHONE CONTROL LINKS



Historical Society

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals	$360.00	$360.00	$720.00
Installation and Maintenance			
Equipment Purchases			
		Total	$720.00

The Historical Society uses a paging answer service from Capital Answering Service to contact security personnel.

Department of Institutions

	F.Y.'86	F.Y.'87	Total
Community Corrections			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 2,595.64	$ 2,595.64	$ 5,191.28
Equipment Purchases:			
3 LB mobile radios	$ 6,457.80		$ 6,457.80
Region III			
F.T.E.'s			
Rentals	$ 480.00	$ 480.00	$ 960.00
Installation & Maintenance			
Equipment Purchases			
Missoula Life Skills Center			
F.T.E.'s			
Rentals	$ 300.00	$ 300.00	$ 600.00
Installation & Maintenance			
Equipment Purchases			
Women's Life Skills Center			
F.T.E.'s			
Rental	$ 363.50	$ 363.50	$ 727.00
Installation & Maintenance			
Equipment Purchases			
Swan River Youth Forests Camp			
F.T.E.'s			
Rental			
Installation & Maintenance			
Equipment Purchases:			
4 portable radios (hand-held)	$ 3,720.00		
2 mobile radios HB	$ 2,800.00		
1 base station	$ 2,480.00		$ 9,000.00
Boulder River School and Hospital			
F.T.E.'s			
Rentals			
Installation & Maintenance			
Equipment Purchases:			
2 LB portable radios (hand-held)	$ 2,640.00		$ 2,640.00
Montana State Hospital			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 1,033.00	$ 1,033.00	$ 2,066.00
Equipment Purchases			

Mountain View School			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 802.53	$ 802.53	$ 1,605.06
Equipment Purchases:			
2 portable radios (hand held) HB	$ 1,500.00		$ 1,500.00
2 mobile radios	$ 2,800.00		$ 2,800.00
Pine Hills School			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 1,279.50	$ 1,279.50	$ 2,559.00
Equipment Purchases:			
1 LB portable radio (hand held)	$ 800.00		$ 800.00
1 LB mobile radio	$ 984.00		$ 984.00
Montana State Prison			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 7,185.00	$ 7,185.00	$14,370.00
Equipment Purchases			
		Total	$52,350.14

All rental requests are for paging answering services utilizing beepers. At many institutions purchase of low-band equipment is necessitated by local communities' lack of high-band and the institution's need to communicate with them. Attempts will be made to utilize used low-band equipment from other state agencies when possible. This will prevent money from being spent on new low-band equipment. We eventually want to convert to high-band as it becomes feasible.

If the request for new high-band equipment is denied from Swan River Youth Camp then a request of $1000 for maintenance and repair will be budgeted for the next biennium in its place. Swan River Youth Forest Camp needs high-band capabilities as soon as possible to provide communication with the Forestry Division in the Swan Valley, with whom they regularly send residents out to work.

Department of Justice

	F.Y.'86	F.Y.'87	Total
Criminal Investigation			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 500.00	$ 500.00	$ 1,000.00
Equipment Purchases:			
3 mobile radios	$ 6,549.00		$ 6,549.00
1 repeater	$ 11,000.00		$ 11,000.00
5 portable radios (20 watt)	$ 17,500.00		$ 17,500.00
5 portable radios (hand-held)	$ 9,000.00		$ 9,000.00
	$ 44,549.00	$ 500.00	$ 45,049.00
Driver Services			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 35.00	$ 35.00	$ 70.00
Equipment Purchases			
	$ 35.00	$ 35.00	$ 70.00
Fire Marshal			
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 60.00	$ 60.00	$ 120.00
Equipment Purchases:			
8 mobile radios HB	$ 11,575.00		$ 11,575.00
	$ 11,635.00	$ 60.00	$ 11,695.00
Highway Patrol			
F.T.E.'s	$ 77,950.00		$ 77,950.00
	$159,050.00	$229,280.00	$ 388,330.00
	$ 23,250.00	$ 36,525.00	$ 59,775.00
	$ 38,988.00	$ 56,934.00	$ 95,922.00
Rentals			
Installation & Maintenance	$ 15,927.00	$ 15,927.00	$ 31,854.00
Equipment Purchases:			
40 HB mobile radios	$ 48,300.00	$ 48,300.00	$ 96,600.00
HB mobile radios/new positions	$ 19,320.00	$ 16,905.00	36,225.00
Equipment to complete HB conversion (see attached detail)	$155.900.00	$155,900.00	311,800.00
Subtotal	$538,685.00	$559,771.00	$1,098,456.00
Biennium Total			$1,155,270.00

In this next biennium the Fire Marshall's Bureau will convert to high-band.

The Highway Patrol will complete its high-band conversion in the '86-'87 biennium. The $77,950 under F.T.E.'s is to purchase contractor's service to

implement the high-band conversion project. The eleven F.T.E.'s in F.Y.'86 and five additional F.T.E.'s in F.Y.'87 are new positions to staff Regional Communications Centers. The $388,330.00 is for salary, the $59,775.00 is for overtime and the $95,922.00 is for employee benefits.

The contractor's services request is based upon 25% of the amount for equipment needed to convert the western half of Montana to high-band. Like the Department of Highways the Highway Patrol should complete their conversion during this next biennium; nevertheless, more resources are needed to ensure implementation is timely and coordinated.

The Highway Patrol is on schedule with its high-band conversion project. All but three mobile relays scheduled for fiscal year 1984 installation are operational. The remaining three installations, one mobile relay near Jordan, one southeast of Baker, and one south of Plentywood, have been postponed until further evaluation of the existing system coverage is complete. The site will soon be picked for the relay south of Plentywood.

At this time the Patrol has fourteen mobile relays in operation covering an area stretching from Glacier County in the west to Sheridan County in the East and to Powder River County in the south. There are no relays at Hysham Hills or at Forsyth.

The Bozeman area installation is near completion. The remote control panel needed in Bozeman to control the Eaglehead Mtn. relay is in place. One more repeater needs to go in northeast of Bozeman to complete this area.

Work began on the Billings area during the summer of 1984. The Billings project includes three mobile relays, a base station at Sacrafice Cliffs and a UHF control link. The repeaters are in place at Red Lodge and at Big Timber. One more repeater is needed between Billings and Roundup. Eventually a repeater will be needed near Hardin to fully cover this district.

The Patrol requested two additional relays to fill in the areas not covered by the fiscal year 1984 installations. One mobile relay is requested south of Sidney and has yet to be installed. The second one is for Sweetgrass County east of Big Timber and is in place, though the squelch tone needs to be changed. Pending the results of the Wolf Point area mobile relay system evaluation, two relays might be relocated from the Jordan and Plentywood sites.

Fiscal Year 1986 and remaining F.Y.'85 installations are being planned west of the Divide. Butte is planned for the spring of 1985 with Missoula and Kalispell planned to follow during the summer of 1985 and spring of 1986.

Some operational problems remain to be solved. The Highway Patrol relay system at Gore Hill (Great Falls) is causing interference with other Highway Patrol relays in the area. A UHF link will be installed from the Helena central dispatch to replace the mobile relay with a remote base station. The mobile relay at Gore Hill will be moved to Choteau to separate the mobile relays in the Great Falls areas which should eliminate the interference. Also, in this geographic area a repeater is needed at the Hudson Bay Divide and is in the planning stages.

HIGHWAY PATROL

Radio Equipment Purchases Detail:
F.Y.'86 - F.Y.'87

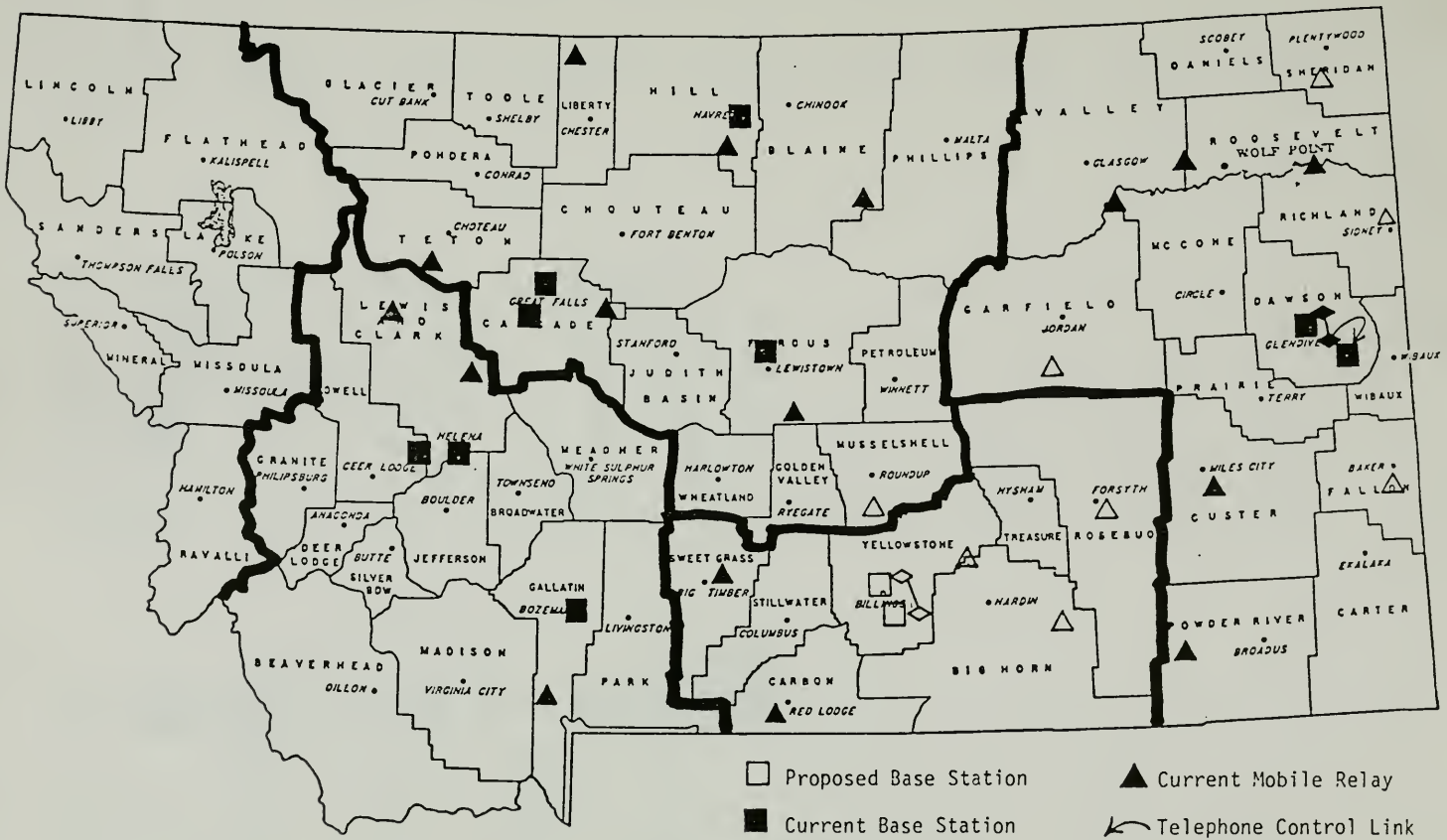
Locations	Item	Approx. Cost
Libby	VHF Repeater	$ 2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Eureka	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Big Mtn	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Kalispell	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150
	100 ft. TX Line	150
	Miscel.	100
	Tower	2,000
Lake Side	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150
	100 ft. TX Line	112
	Miscel.	100
Plains	VHF Repeater	2,300
	VHF Antenna	240
	VHF Duplexer	833
	100 ft. TX Line	112
	Miscel.	100
TV Mtn	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150
	100 ft. TX Line	112
	Miscel.	100

Missoula	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150
	100 ft. TX Line	112
	Miscel.	100
University Mtn	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Union Peak	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Philipsburg	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Hamilton	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Dillon	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Ennis	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Livingston	VHF Repeater	2,400
	VHF Antenna	240
	Duplexer	833
	100 ft. TX Line	112
	Miscel.	50
Butte	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150

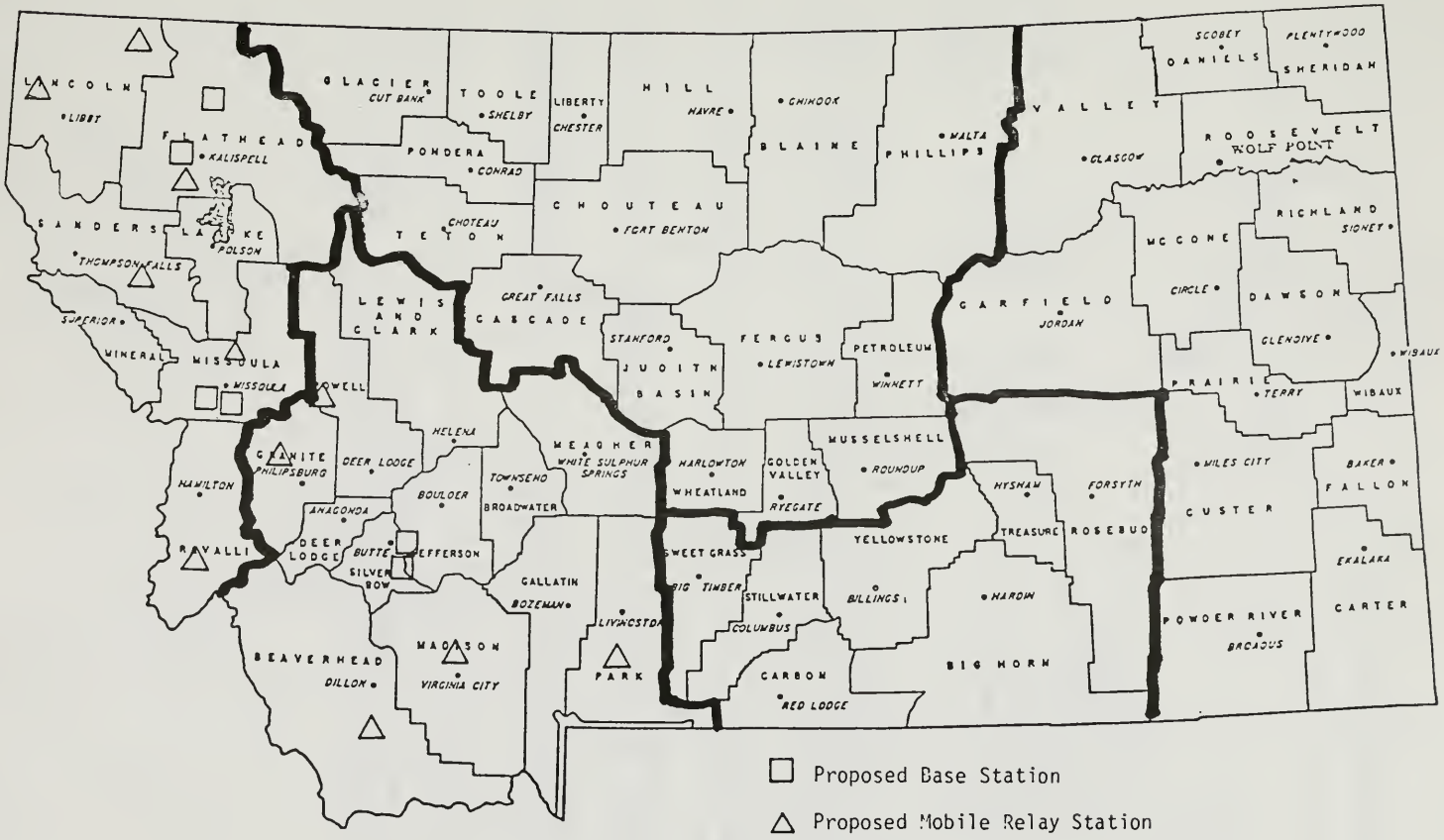
	100 ft. TX Line	112
	Miscel.	100
XL Heights	VHF Base Station	2,300
	UHF Base Station	2,500
	VHF Antenna	240
	UHF Antenna	150
	100 ft. TX Line	112
	Miscel.	100
		$ 74,400
Helena	Control Console	20,000
Missoula	Control Console	20,000
Helena	Test Equipment	10,000
	TOTAL	$124,000

10	Pager Units	$ 3,000
20	Hand Held Portables	20,000
5	Towers	10,000
3	Interface Panels	4,500
60	Mobile Units	144,900
	Miscellaneous Hardware	5,000
	Total	187,400
		124,400
	GRAND TOTAL	$311,800

CURRENT HIGHWAY PATROL HIGH BAND CONVERSION PLAN FOR F.Y.'s '84-'85



HIGHWAY PATROL HIGH BAND CONVERSION PLAN FOR F.Y.'s '86-'87



Department of State Lands

Forestry Division

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
4 base stations HB	$ 4,800.00	$14,500.00	$ 19,300.00
36 portable radios HB	$20,640.00	$28,310.00	$ 48,950.00
28 mobile radios HB	$33,200.00	$19,600.00	$ 52,800.00
5 repeater/mobile relays HB	$18,500.00	$10,500.00	$ 29,000.00
misc. equipment HB	$18,250.00	$10,300.00	$ 28,550.00
		Total	$178,600.00

The Fire Suppression Bureau of the Forestry Division is expanding coverage areas and improving existing communications capabilities of their existing statewide high-band system. $30,500 of the F.Y.'86 proposed budget will be used by the Fire Suppression Bureau along with $19,100 of the F.Y.'87 monies.

The Kalispell field office needs $17,390 in F.Y.'86 and $19,100 in F.Y.'87 for mostly replacement of current older equipment and expanded coverage in the region.

The Missoula region will use $30,500 in F.Y.'86 and $22,900 in F.Y.'87 to replace old HB equipment and improve some coverage in the Clearwater and Anaconda units.

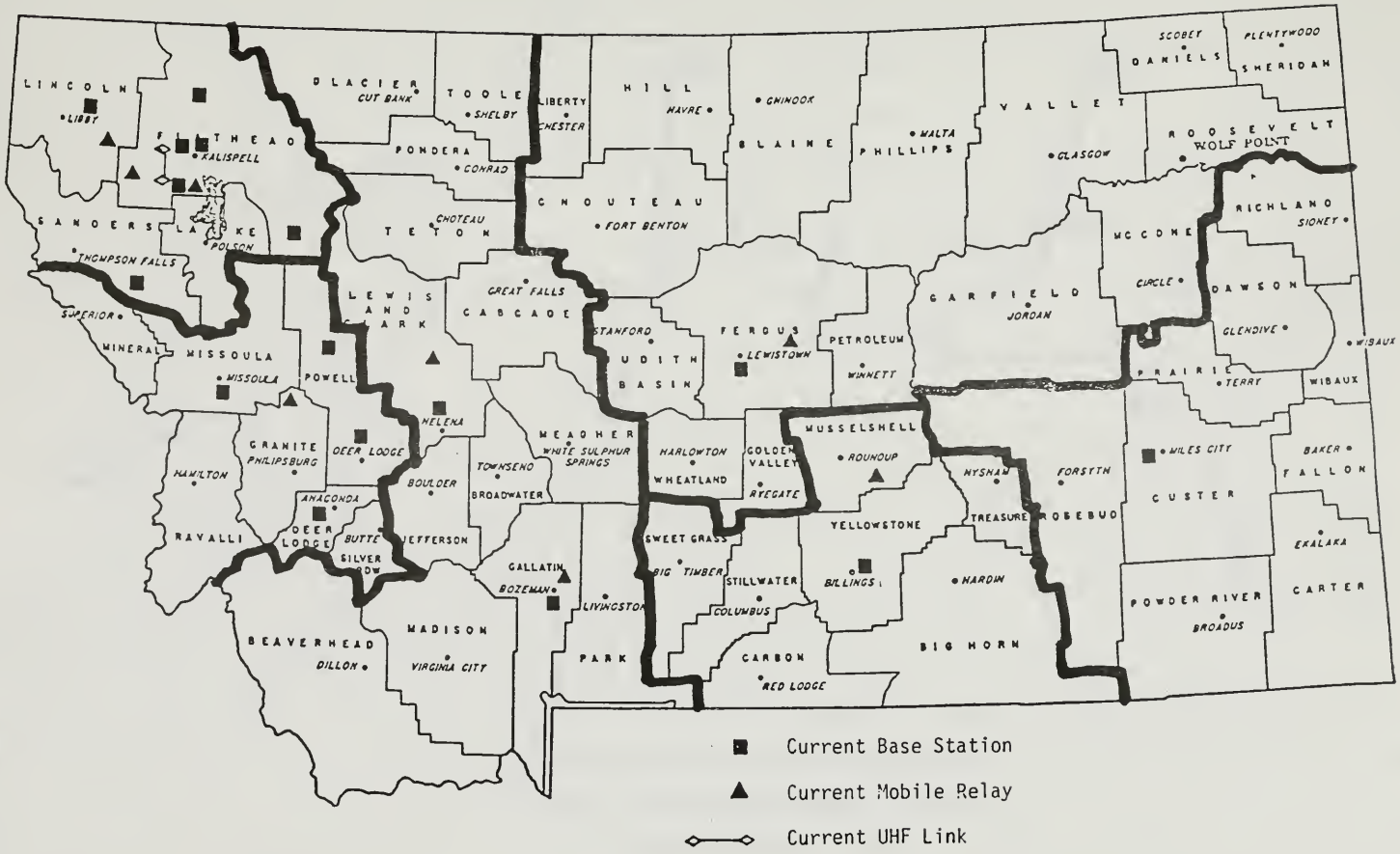
The Helena area will use $4,100 F.Y.'86 funds and $11,000 in F.Y.'87 to replace old radios and extend coverage in Beaverhead, Madison, and southern Jefferson Counties for fire suppression purposes.

The Lewistown region needs $7,400 in F.Y.'86 and $3,610 in F.Y.'87 to improve NELO's support to the 10 counties in the Cooperative Fire Control Program.

The remaining biennium requested monies will be used to upgrade and replace old equipment in the Miles City region and develop a mobile relay system in the northern portion of the area for fire suppression activities.

STATE LANDS - COMMUNICATIONS NETWORK

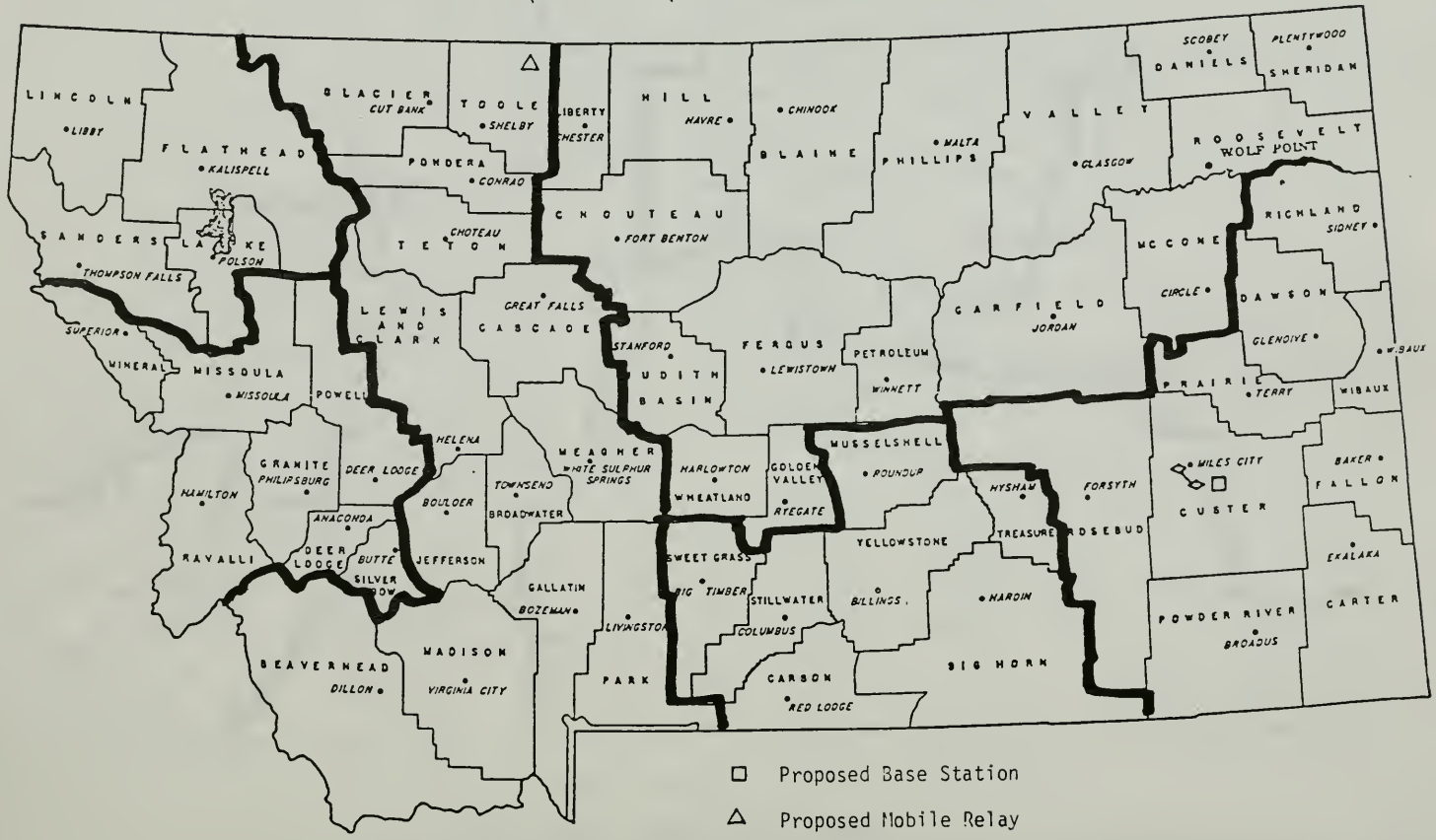
CURRENT STATUS



LANDS DEPARTMENT

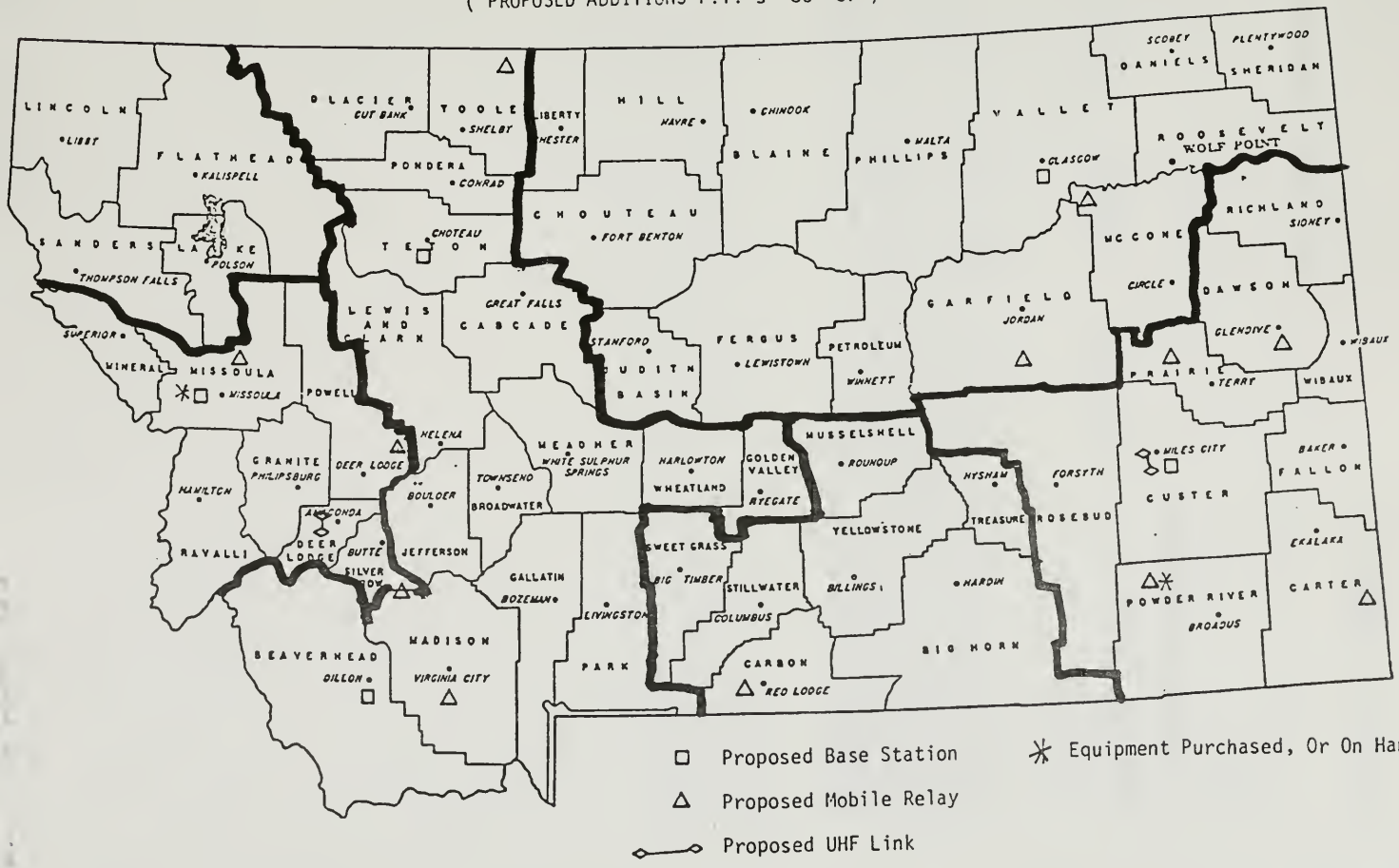
PROPOSED COMMUNICATIONS NEEDS F.Y.'s '86-'87

(BASED ON EQUIPMENT NEEDS PRIOR TO 1982)



STATE LANDS - COMMUNICATIONS NETWORK

(PROPOSED ADDITIONS F.Y.'s '36-'87)



□ Proposed Base Station

△ Proposed Mobile Relay

Proposed UHF Link

✳ Equipment Purchased, Or On Hand

Department of Livestock

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation and Maintenance	$ 5,013.00	$ 5,013.00	$10,026.00
Equipment Purchases:			
2 helicopter radios	$ 2,200.00	$ 2,200.00	$ 4,400.00
		Total	$14,426.00

The Department of Livestock has 25 mobile units equipped with both low-band radios and high-band radios. As each officer in the Brands Enforcement Division must cover three counties on the average, they need both low and high-band capabilities to communicate with the counties that have converted to high-band and those still remaining on low-band. These officers use the Highway Patrol's mobile relays when necessary. The low-band radios can be dropped when those local agencies that the officers need to communicate with convert over to high-band frequencies.

Department of Military Affairs

	F.Y.'86	F.Y.'87	Total
Army National Guard Headquarters F.T.E.'s			
Rentals			
Installation & Maintenance	$ 2,500.00	$ 2,500.00	$ 5,000.00
Equipment Purchases		$ 6,000.00	$ 6,000.00
D. & E. S. Division F.T.E.'s			
Rentals			
Installation & Maintenance	$ 1,500.00	$ 1,500.00	$ 3,000.00
Equipment Purchases	$ 3,500.00	$ 3,500.00	$ 7,000.00
		Total	$21,000.00

Both the Installation and Maintenance and the Equipment Purchases budgets for the Disaster and Emergency Services Division are half federal monies and half state general fund monies. The $6,000 for equipment purchases in F.Y.'87 for the Army National Guard Headquarters is for one 200 WATT HF single sideband base station. The equipment purchases for Disaster and Emergency Services in F.Y.'86 and '87 are for radio supplies and minor equipment, not for inventoriable items.

Public Services Commission

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation and Maintenance	$ 800.00	$ 350.00	$1,150.00
Equipment Purchases			
2 mobile radios	$2,000.00		$2,000.00
4 mobile radios	federally funded		
3 mobile radios			federally funded
		Total	$3,150.00

The two new mobile radios in FY86 are dependent upon the approval of two new F.T.E.'s and automobiles. The four mobile radios in FY86 and the three mobile radios in FY87 are being purchased by federal funds.

Department of Revenue

	F.Y.'86	F.Y.'87	Total
F.T.E.'s			
Rentals			
Installation & Maintenance	$ 226.00	$ 226.00	$ 452.00
Equipment Purchases			
		Total	$ 452.00

The Revenue Department is currently using fifteen low-band radios. They have not requested high-band equipment as they can still communicate with the local law enforcement agencies; however, as more and more local law enforcement agencies convert to high-band and drop their low-band capabilities it will dictate that the Revenue Officers and Medicaid Fraud Officers do the same.

University System

	F.Y.'86	F.Y.'87	Total
Montana State University			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
4 Portable radios HB		$4,000.00	$ 4,000.00
Eastern Montana College			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
4 Portable radios HB	$4,000.00		$ 4,000.00
Northern Montana College			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
3 Pagers HB	$ 400.00	$ 200.00	$ 600.00
2 Veh. mob. radios HB	$1,000.00	$1,000.00	$ 2,000.00
2 Hand held radios HB	$1,000.00	$1,000.00	$ 2,000.00
Western Montana College			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
2 Base stations HB	$4,500.00		$ 4,500.00
4 Veh. mob. radios HB	$1,000.00	$3,000.00	$ 4,000.00
4 Portable radios HB		$4,000.00	$ 4,000.00
University of Montana			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
1 Veh. mob. radio HB	$1,000.00		$ 1,000.00
5 Portable radios HB	$1,000.00		$ 1,000.00
1 Remote control radio HB	$ 500.00		$ 500.00
10 Pagers HB	$2,000.00		$ 2,000.00
Montana Tech			
F.T.E.'s			
Rentals			
Installation and Maintenance			
Equipment Purchases:			
1 Hand held radio HB		$1,000.00	$ 1,000.00
	Biennium Total		$30,600.00

The portable radios for Montana State University are for the student security group and to replace old equipment. They plan two for each of these categories (student security and replacement group).

Pending sufficient funding the portable radios for Eastern Montana College will be distributed as such: three for the Physical Plant Dept. and one for the Security Patrol.

Additional pagers are needed for new personnel in Northern's Physical Plant Department. Additional mobile and portable items needed for improved physical plant communications capabilities.

The radio equipment requests for Western Montana College are for the Security and Maintenance Departments and for communications with the Birch Creek Outdoor Education Campus which should be complete by late summer 1985.

The University of Montana's radio equipment requests break down as follows: one base station, three vehicular mobile radios, eleven portable radios, and two remote control stations are for the Security Patrol; ten portable radios, four remote control stations, and ten pagers are for the Physical Plant Department; and one remote control stations for the Yellow Bay Biological Station.

Montana Tech intends to buy one new hand held radio (HB) in FY 87 for physical plant personnel. They contract out their security needs.

APPENDIX B

STATE OF MONTANA
LAND-MOBILE RADIO FREQUENCIES
POLICIES AND PROCEDURES

I. Purpose: To provide guidelines for the effective management of high-band (VHF) frequencies in use by Montana Public Safety agencies and to provide methods for developing efficient use of the Public Safety frequency spectrum.

II. Scope: The Land Mobile Radio Plan concerns the effective management and efficient use of Public Safety frequencies in Montana. The Plan sets the guidelines for frequency allocations for Public Safety Services as defined in Section 90 of the Federal Communications Commission Rules and Regulations: Local Government Radio Service, Section 90.17; Police Radio Service, Section 90.19; Fire Radio Service, Section 90.21; and Subpart C, Special Emergency Radio Service.

III. Responsibilities:

A. The Federal Communications Commission (FCC) is the final approving authority for Public Safety applications.

B. The Department of Administration, Telecommunications Bureau has the responsibility for coordinating Public Safety frequency use in Montana. Through the Association of Public Safety Communications Officers, (APCO) the Telecommunications Bureau recommends to the FCC the conditions of authorization for each Public Safety applicant.

IV. Emergency Mutual Aid Frequencies

The State of Montana has been authorized by the FCC to operate four mutual aid radio networks to provide common channel access to all public agencies in Montana. In the three functional areas of law enforcement, local government and emergency medical services (EMS), the State has established guidelines for use of the mutual aid channels.

A. Mutual Aid Channels

The Department of Administration is the FCC licensee for the mutual aid frequencies listed below. Users need only secure a State Permit to operate on these frequencies.

1. 153.905 MHz - Interagency/Intergovernmental
2. 154.070 MHz - Fire Service
3. 155.475 MHz - National Law Enforcement
4. 155.790 MHz - Statewide Law Enforcement Interagency

Permits may be requested from the Telecommunications Bureau, Room 222, Mitchell Building, Helena, Montana, 59620.

B. Interagency/Intergovernmental

153.905 MHz - This frequency is the mutual aid frequency that all two-way radio stations authorized to communicate in the Public Safety and Special Emergency Radio Services are authorized to operate on after a permit has been issued to the user by the Telecommunications Bureau. Though this frequency is designated by the Federal Communications Commission as a mobile only frequency it may be used in base stations on a secondary basis in section 173(h), part 90, chapter 1, title 47, of the Code of Federal Regulations. In most cases this base station use will be secondary to the same organizations mobile units and used only in emergency situations; therefore, it should be compatible. We recommend that all Public Safety and Special Emergency Radio Service users, utilizing high-band frequencies get a permit and use this frequency.

C. Law Enforcement

155.475 MHz - This frequency is regulated by the Federal Communications Commission as a nationwide law enforcement emergency within the parameters of a state plan. Out plan designates this as our law enforcement mutual aid frequency to be used in emergency situations only, and we recommend that all law enforcement agencies get a permit and use this frequency, if they are operating on high-band frequencies. This frequency may be used in base stations as well as in mobile units.

155.790 MHz - This frequency is the statewide law enforcement frequency for Montana. This frequency can be used as an inter-service common channel between all law enforcement agencies in the state. Routing inter-agency communications are <u>not</u> authorized on this channel. It is designed for the sheriffs to speak to the police chief, the campus security, the Highway Patrol, the Fish, Wildlife and Parks enforcement officer and all other law enforcement entities. We recommend that all law enforcement agencies authorized to communicate in the Police Radio Service and operating on high-band frequencies, get a permit for this inter-agency channel and use it. This frequency also is for use in base stations as well as mobile units.

D. Fire

154.070 MHz - This frequency is the statewide fire coordinations mutual aid frequency for inter-agency on site coordination of fire fighting resources. All agencies authorized to communicate in the Fire radio service are advised to use this frequency after securing a permit from the Telecommunications Bureau. Like 153.905 MHz, 154.070 MHz is a mobile only frequency that may be used in base stations on a secondary basis to the mobile use (Section 173(h), Part 90, Chapter 1, Title 47).

E. Emergency Medical Services Frequencies Plan

155.280 MHz - This frequency is a channel designated only for use between ambulances and hospitals. It is so designated statewide. It should not be used for dispatching of personnel or paging.

155.325 MHz - This frequency is for Emergency Medical Services (EMS) Region 2 (see Annex 1) dispatch communications; ambulance to dispatch center and paging of EMS personnel only. The paging here is only for personnel that are quick response personnel to the scene of an accident of injury.

155.340 MHz - This frequency is reserved for ambulance to hospital communications on a regional level. It may be put in a mobile relay site a higher elevation or greater power to communicate with ambulances that are approaching from outlying areas. The 155.280 MHz is reserved for local ambulances.

155.385 MHz This frequency is for EMS Region 1 (Western) and Region 3 (Eastern) dispatch communications; ambulance to hospital and paging of EMS personnel only. The paging here is only for personnel that are quick response personnel to the scene of an accident of injury.

To use the frequencies listed below applications must be made to the Federal Communications Commission. These four frequencies are designated for use in both base stations and mobile radio units.

155.280 MHz Statewide for Local Ambulance to Hospital
155.325 MHz Central Region Dispatch Communications and Paging
155.340 MHz Statewide for regional Ambulance to Hospital
155.385 MHz Eastern and Western Regions Dispatch Communications and Paging

F. Search and Rescue

155.160 MHz - This frequency is to facilitate on-the-scene coordination of search and rescue operations, the Federal Communications Commission has designated 155.160 MHz as the national search and rescue frequency. The Special Emergency Radio Service frequency 155.160 MHz is in use in North Dakota, South Dakota, Wyoming, and Idaho.

155.220 MHz - This frequency is to be used as the primary frequency for all search and rescue operations in Montana. Additional frequencies should be requested as needed.

To use the frequencies listed below, applications must be made to the Federal Communications Commission. These two frequencies are designated for used in both base stations and mobile radio units.

155.160 MHz National Search and Rescue, on site coordination

155.220 MHz Statewide Search and Rescue Primary Channel

155.160 MHz, 155.200 MHz, 155.475 MHz, 155.790 MHz, 154.070 MHz, 153.905 MHz, 155.325 MHz, and 155.385 MHz should be used with open squelch. 155.340 MHz and 155.280 MHz should be used with the appropriate Dual Tone Multi-Frequency (DTMF) code as per the state plan (see Annex 2).

V. Mutual Aid Frequency Management and Administration

A. Management:

The mutual aid frequency management program relies on shared and cooperative use of all frequencies in the Public Safety and Special Emergency Radio Services. To obtain this goal the State of Montana will provide access to the State Mutual Aid Network on a controlled basis to allow full utilization of each mutual aid frequency by regulating access while encouraging full participation of Public Safety and Special Emergency agencies on a statewide basis. Access will be controlled to insure adequate frequency loading in a specific area and to insure that all Public Safety and Special Emergency agencies have at their disposal the full resources available to protect the safety and/or property of the people of Montana.

B. Administration:

State emergency frequencies are administered by the Telecommunications Bureau, Department of Administration, located in the Sam W. Mitchell Building, Room 222, Helena, Montana, 59620. (406) 444-2586.

1. Procedure

Any public safety agency desiring to utilize a frequency licensed to the State of Montana will be required to enter into a cooperative agreement with the State of Montana and provide the following documentation:

a. The Chairperson of the County Commissioners, Chief Executive of a Municipality, County Sheriff, City Chief of Police, City or County Fire Chief, DES Coordinator, or similar officer of an agency desiring use of a frequency will send an application for State Permit to the Telecommunications Bureau.

b. The requesting agency will certify that it meets all eligibility requirements as specified by the Federal Communications Commission under Part 90, Section 90.17(a), 90.19(a), 90.21(a), and 90.421(a), (b), (c).

c. The requesting user will provide a complete list of the radios using State emergency frequency(ies). The list shall include:

Base and Mobiles - Type, model and serial number of the radio with the number of channels in operation and each frequency or set of frequencies installed.

Hand Held Portables - Type, model and serial number of channels in operation and each frequency or set of frequencies installed.

d. The agency will assure that these frequencies will be installed only in radios owned or exclusively controlled by the requesting agency and the equipment complies with all applicable F.C.C. Rules and Regulations, Volume 5, Part 90.

e. The requesting agency will provide its assurance that it will comply with all applicable F.C.C. rules, regulations, Volume 5, Part 90, for the cooperative use of a State emergency frequency.

The State will provide each approved user with a cooperative agreement for use of the frequencies in question. The cooperative agreement for use of the frequencies will be signed by an authorized representative of the Telecommunications Bureau and the authorized agent of the requesting agency.

All applications submitted in accordance with these policies will be processed within 30 days.

2. Eligibility

Requesting agencies must meet the eligibility criteria for each frequency requested.

a. Police Emergency Frequency

(1) The agency must be duly sworn and authorized to perform law enforcement duties as are established by State statutes and local ordinances with full police powers and responsibility for life and property in their jurisdictional area.

(2) All law enforcement agencies requesting use of the policy emergency frequencies, 155.475 MHz and 155.790 MHz in base, mobile or portable radios must provide a written statement demonstrating eligibility and assuring full compliance under F.C.C. Rules Sections 90.19(a) and 90.421 and State regulations pertaining to this agreement.

b. Interagency/Intergovernmental Emergency Frequency

(1) The agency must be a county, city, town or similar political subdivision as established by State

statutes. The agency may submit applications on behalf of other entities providing public safety services within their jurisdiction (e.g. school bus contractors, search and rescue, wrecker service).

(2) All applicants requesting use of the interagency/intergovernmental emergency frequency in base, mobile or portable radios must provide a written statement demonstrating eligibility under the applicable F.C.C. Rule Section, Part 90 and assuring full compliance with 90.421, and State regulations pertaining to this agreement.

c. Fire Emergency Frequency

(1) The agency must be a county, city, town or similar political subdivision or persons or organization charged with specific fire protection activities as established by State statutes and/or local ordinances.

(2) All fire protection agencies requesting use of the fire emergency frequency in base, mobile, and/or portable radios must provide a written statement demonstrating eligibility under F.C.C. Rule Section 90.21(a) and assuring full compliance with 90.421 and State regulations pertaining to this agreement.

VI. State Rules and Regulations

A. No section of the State's land-mobile frequency policy or its subsequent procedure should be construed to imply that the State has the authority to assign or license a frequency currently licensed to the State of Montana, nor should this procedure be interpreted as providing the State with any regulatory power over these frequencies, other than those specific control functions the State is obligated to accept as a licensee.

B. The following functions will be allowed when using State emergency frequencies provided said functions are included as an integral part of the approved cooperative agreement and its appendices;

1. Emergency cross channel patch through a device approved by the Telecommunications Bureau.

2. Emergency telephone patch through a device approved by the Telecommunications Bureau.

C. All users must operate in total compliance existing F.C.C. rules and regulations and State of Montana rules, regulations, laws, and administrative policies.

D. All agencies will confiscate all crystals or frequency elements for the frequencies authorized under its cooperative agreement when a radio is phased out of service or is no longer in the control of the agency. Under no circumstances will crystals or frequency elements be left in a radio no longer under the agency's control. The agency will provide written notification (to include the radio type, model number, and serial number) to the Telecommunications Bureau within 30 days of the radio being phased out of service or no longer in the control of the agency.

E. If mobile radios or hand held portables authorized under cooperative agreements are transferred to a new vehicle, agency, or person, written notification of such transfer must be provided to the Telecommunications Bureau by the cooperating agency within three months of the date transfer.

F. All agencies installing new radios using State Emergency Frequency will notify and receive approval from the Telecommunications Bureau prior to the radio being placed in service. The written notification shall include:

Base and Mobiles - Type, model number and serial number of the radio together with the type and license number of the vehicle in which it is installed.

Hand Held Portables - Type, model number and serial number of the radio, together with the name of the agency or person to whom the radio is assigned.

G. Communications on State emergency frequencies are limited to the following:

1. Emergency communications between law enforcement agencies from various jurisdictions. (155.790 MHz)

2. Emergency or administrative communications by itinerant law enforcement officials when away from their normal jurisdiction (155.790 MHz and 155.475 MHz).

3. Command and control communications be supervisory personnel in situations where public safety agencies from multiple jurisdictions are responding to an emergency (152.905 MHz).

4. Urgent administrative communications between public safety agencies where no other means of communication is readily available (153.905 MHz).

H. Enforcement of all rules established for State emergency frequencies is essential if frequency usage is are to be effective. All agencies are encouraged to report violations of established rules to the Telecommunications Bureau.

Reported violations will be reviewed by the Telecommunications Bureau and a warning letter sent to the manager of the offending agency, outlining all pertinent details of the reported violations. The agency will also be advised that its cooperative agreement is subject to cancellation, as proper operation was one of the commitments made prior to obtaining permission to using the frequency. Warning letters will require a written reply to the Telecommunications Bureau within ten days of receipt, detailing what action the agency has taken to prevent future violations.

If an agency repeatedly violates the rules established for use of State emergency frequencies it's cooperative agreement will be cancelled.

I. Authorization covered under this policy can be immediately terminated upon verification of any infraction of the State of Federal Rules or Regulations with a copy of the cooperative agreement cancellation sent to the F.C.C. Enforcement Division. Upon written notification from the Telecommunications Bureau terminating its authorizations, the agency will cease all operations on State emergency frequencies and remove the frequency elements from their radios.

VII. Frequency Assignment

Frequency assignments are made based on information made available from the F.C.C., requests for frequency coordination, and user/vendor input. Frequencies assigned to the land mobile radio systems in the Public Safety Radio Service are available on a shared basis only and cannot be assigned for the exclusive use of any licensee.

Frequencies are assigned to reduce interference and to make the most effective use of the available spectrum. Stations receiving or causing harmful interference are expected to cooperate and resolve problems by mutually satisfactory arrangements. If the licensees are unable to do so, the Federal Communications Commission may impose restrictions including specifying the transmitter power, antenna height, or area or hours of operations of the stations concerned.

Frequency coordination or an engineering study is required by F.C.C. Rules as part of the applications process. (Section 90.175 Frequency Coordination Requirements.) Frequency coordination is performed in accordance with Part III of the Associated Public Safety Communications Officers Frequency Coordinations System Manual.

VIII. Tone Code Squelch Assignments

Continuous Tone Coded Squelch Signaling (CTCSS) will be employed to protect high-band systems from co-channel interference. CTCSS prevents the inadvertent access to a radio receiver by a co-channel user.

The tone code assignments by county in Hz are as follows:

Beaverhead	146.2	McCone	151.4
Big Horn	107.2	Meagher	107.2
Blaine	114.8	Mineral	156.7
Broadwater	100.0	Missoula	146.2
Carbon	114.8	Musselshell	131.8
Carter	114.8	Park	114.8
Cascade	141.3	Petroleum	100.0
Chouteau	131.8	Phillips	156.7
Custer	167.9	Pondera	100.0
Daniels	141.3	Powder River	156.7
Dawson	146.2	Powell	114.8
Deer Lodge	107.2	Prairie	156.7
Fallon	100.0	Ravalli	151.4
Fergus	162.2	Richland	114.8
Flathead	123.0	Roosevelt	131.8
Gallatin	192.8	Rosebud	151.4
Garfield	162.2	Sanders	162.2
Glacier	107.2	Sheridan	107.2
Golden Valley	151.4	Silver Bow	100.0
Granite	141.3	Stillwater	156.7
Hill	107.2	Sweet Grass	162.2
Jefferson	156.7	Teton	151.4
Judith Basin	114.8	Toole	162.2
Lake	107.2	Treasure	162.2
Lewis and Clark	203.5	Valley	162.2
Liberty	156.7	Wheatland	167.9
Lincoln	151.4	Wibaux	107.2
Madison	167.9	Yellowstone	146.2

CTCSS assignments pertain to those frequencies assigned to the applicants. Mutual aid frequencies will not be tone guarded. Additional tones are available for use by any Public Safety Agency. Coordination for a specific tone through the Telecommunications Bureau will reduce the likelihood of harmful interference caused by distant co-channel stations.

IX. Interference Analysis

It is the goals of the State Radio Plan to allocate frequencies in such a way as to reduce interference while conserving spectrum. Several types of interference are described below. Each has a "technical fix" and should be assumed as necessary to effective system operations.

A. Definitions

Interference is either "harmful" or "nuisance". Harmful interference is defined as that which captures a receiver and thereby repeatedly interrupts or prevents communications.

Nuisance interference is not usually considered by the frequency coordinator during the interference analysis. Nuisance interference does not capture a receiver but can be heard and is therefore an

annoying, unpleasant nuisance. This type of interference is easily resolved by the use of continuous tone or digitally coded squelch.

All new systems should be installed with tone squelch as assigned in Section VI. Existing systems receiving such nuisance interference should be retrofitted with squelch controls as assigned in Section VI.

B. Categories of Interference:

1. Co-channel interference results from unwanted signals on an assigned frequency. Such signals usually are the result of either unforeseen propagation characteristics of a signal, causing it to be received by another user, or by an unforeseen propagation phenomena causing users assigned to the same channel to interfere.

2. Adjacent-channel interferences is caused by signals near the assigned frequency which have sufficient signal strength to overcome the selectivity characteristic of the receiver. These signals are most often the result of geographic proximity of an assigned adjacent channel transmitter. Adjacent channel interference is usually limited to co-site situations or those in which transceivers are located within a few miles of each other.

3. Intermodulation interference is the result of mixing together of two frequencies of their harmonics. This type of interference can often be recognized by the fact that the interference may cease in the middle of a conversation when one of the attending transmitters ceases transmitting.

C. Interference Reports

The State of Montana has no jurisdiction over Public Safety Radio Stations operating in Montana other than State agencies. A general rule to follow in interference resolution is: "the last stations on the air corrects the problem". Reports of harmful interference should be filed directly with the Federal Communications Commission, Seattle Regional Office (206) 442-7653. The Telecommunications Bureau will provide technical assistance, but can not file the report for the aggrieved party.

X. Statewide Frequency Allocation

A. Purpose: The purpose of frequency allocation is to provide for the future systematic planning and assignment of high-band frequencies in the Police and Local Government Radio Services to State and local government entities in Montana.

B. General: Each county is assigned a set of high-band frequencies in the Police Radio and Local Government frequency spectrums. Frequency A is a transmit frequency for a high power mobile relay or

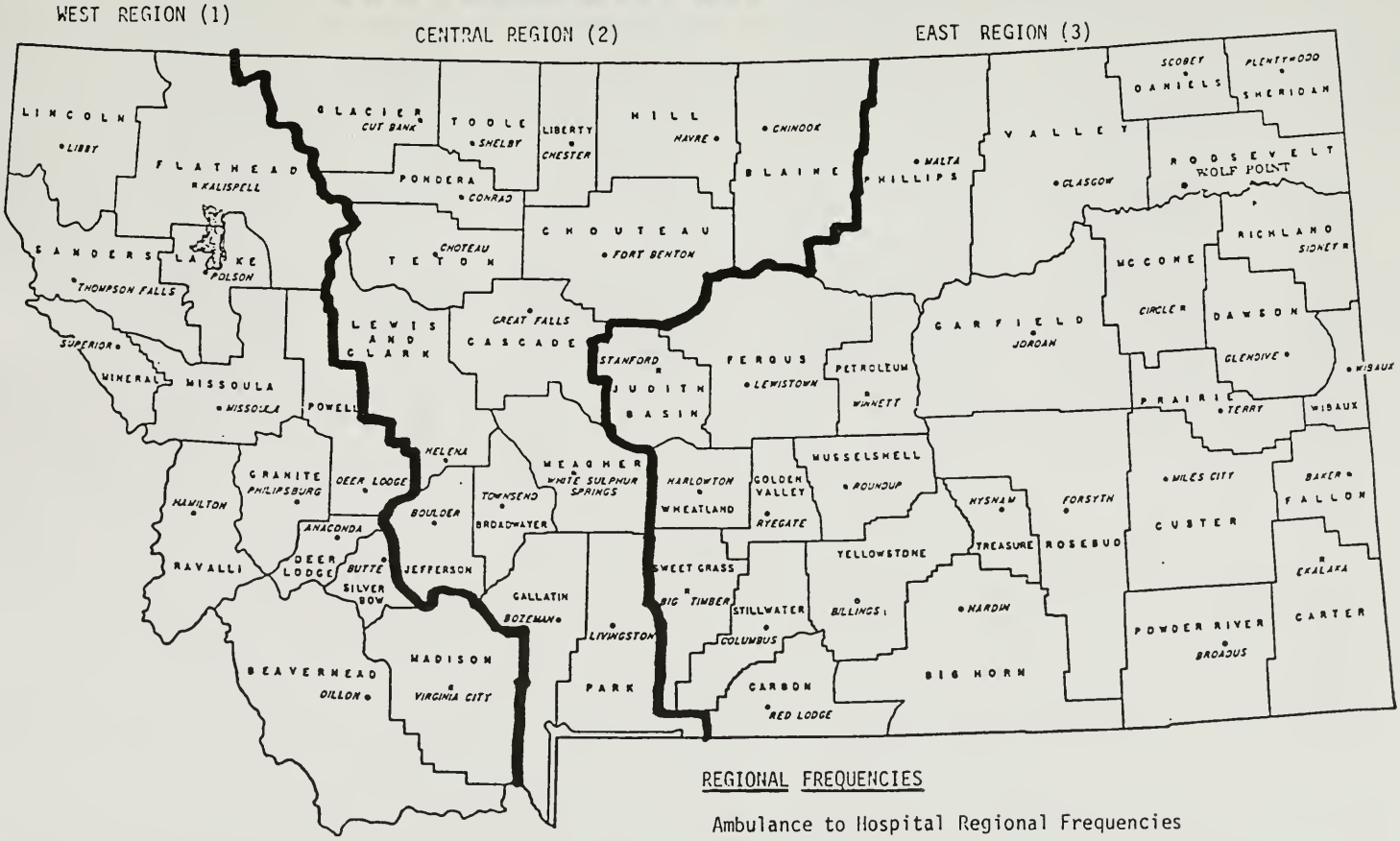
base station. Frequency B is the Base-mobile simplex frequency for a low power base for localized transmission. Frequency B will be formally assigned to only those system of 40 watts or less, and unity gain antennas. Frequency B can be assigned to a county as its secondary channel and the primary channel for a municipality or other tax district within the county.

A mobile only frequency is assigned to each county as a mobile relay access frequency from a fixed-base control or mobile units. This would be called Frequency C.

The plan will remain valid as long as it is recognized by our neighboring states' coordinators. Also, it is a flexible plan that will change with needs and circumstances.

Annex 3 and Annex 4 show frequencies that have been planned for the indicated counties in the Police Radio Service and in the Local Government Radio Service. The counties left blank currently have licensed frequencies in the respective radio services and thus none have been reserved for those counties. Other frequencies are available for all 56 counties in both radio services as needed and justified.

EMS REGIONAL MAP



REGIONAL FREQUENCIES

Ambulance to Hospital Regional Frequencies

155.385 MHz East and West Regional Frequency
155.325 MHz Central Regional Frequency
155.280 MHz Ambulance to Hospital Statewide

ANNEX 1

EMERGENCY MEDICAL SERVICES DTMF CODE ASSIGNMENT

AREA I	DTMF CODE
St. John's Lutheran Hospital, Libby	010
North Valley Hospital, Whitefish	020
Kalispell Regional Hospital, Kalispell	030
St. Joseph Hospital, Polson	040
St. Luke Community Hospital, Ronan	050
Clark Fork Valley Hospital, Plains	060
Holy Family Hospital, St. Ignatius	070
AREA II	
Granite County Hospital, Phillipsburg	075
Communications Dispatch Center, Missoula	0911
St. Patrick's Hospital, Missoula	078
Missoula Community Hospital, Missoula	079
Seeley Lake Clinic, Seeley Lake	080
Mineral County Hospital, Superior	081
Daly Memorial Hospital, Hamilton	082
Powell County Memorial Hospital, Deer Lodge	083
Missoula General Hospital, Missoula	084
AREA III	
Madison Valley Hospital, Ennis	183
St. James County Hospital, Butte	184
Silver Bow General Hospital, Butte	185
Community Hospital of Anaconda	186
Barret Hospital of Dillon	187
Galen State Hospital, Galen	189
Ruby Valley Hospital, Sheridan	190
Warm Springs State Hospital, Warm Springs	191
AREA IV	
Deaconess Hospital, Bozeman	258
Livingston Memorial Hospital, Livingston	259
Boulder Dispatch Center, Boulder	260
Broadwater Hospital, Townsend	262
AREA V	
Columbus Hospital, Great Falls	340
Deaconess Hospital, Great Falls	341
Fort Harrison V.A. Hospital, Helena	350
Shodair Children's Hospital, Helena	352
Helena 911 Center, Helena	353
Mountainview Memorial Hospital, Warm Springs	354

AREA VI

Memorial Hospital, Cut Bank	450
PHS Indian Hospital, Browning	451
Pondera County Hospital, Conrad	452
Teton Memorial Hospital, Choteau	453
Toole County Hospital, Shelby	454

AREA VII

Chouteau County District Hospital, Ft. Benton	517
Northern Montana Hospital, Havre	518
Northern Montana Hospital Local System, Havre	519
Rocky Boy Medical Center, Rocky Boy	520
Fort Belknap Medical Center, Ft. Belknap	521
Liberty County Hospital, Chester	523
Big Sandy Medical Center, Big Sandy	524

AREA VIII

Roundup Memorial Hospital, Roundup	592
Wheatland Memorial Hospital, Harlowton	593
Central Montana Hospital, Lewistown	594
Dr. Steve Ginarelli, Stanford	656

AREA IX

Sweet Grass Community Hospital, Big Timber	670
Big Horn Community Memorial Hospital, Hardin	671
PHS Indian Hospital, Crow Agency	672
Deaconness Hospital, Billings	673
St. Vincent's Hospital, Billings	674
Carbon County Memorial Hospital, Red Lodge	675
Stillwater Community Hospital, Columbus	676
Laurel Clinic, Laurel	678

AREA X

Rosebud Community Hospital, Forsyth	780
Holy Rosary Hospital, Miles City	781
Fallon Memorial Hospital, Baker	782
Powder River Medical Services, Broadus	783
Veteran's Administration Hospital, Miles City	784
Dahl Memorial Hospital, Ekalaka	786
PHS Hospital, Lame Deer	787

AREA XI

Glendive Community Hospital, Glendive	850
McCone County Hospital, Circle	851
Garfield County Hospital, Jordan	852
Community Memorial Hospital, Sidney	853

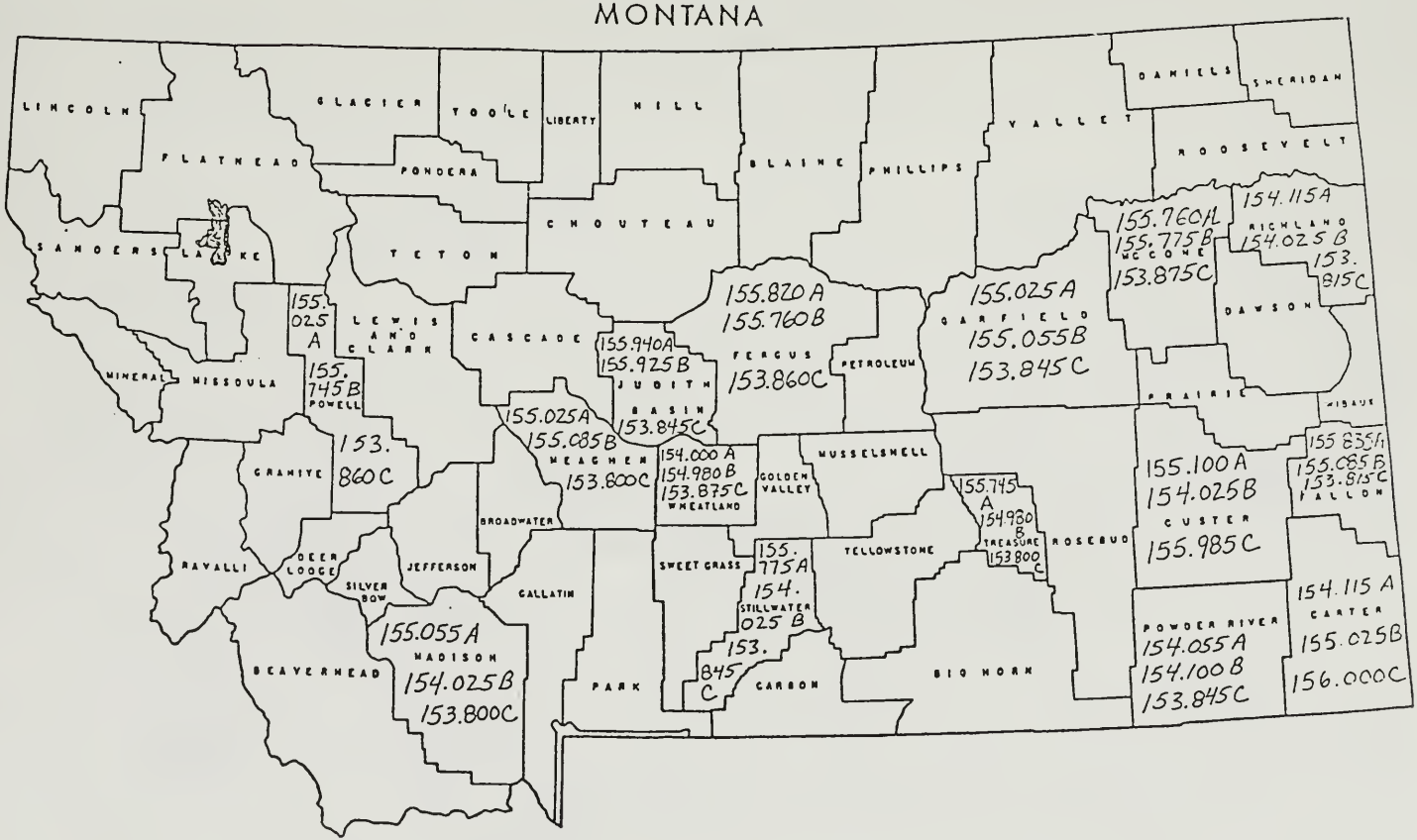
Prairie Community Hospital, Terry	854

AREA XII

Roosevelt Memorial Hospital, Culbertson	925
Frances Mahone Deaconess Hospital, Glasgow	926
Phillips County Hospital Association, Malta	927
Sheridan Memorial Hospital, Plentywood	
Poplar Community Hospital, Poplar	
Daniels Memorial Hospital, Scobey	930
Trinity Hospital, Wolf Point	931

LOCAL GOVERNMENT

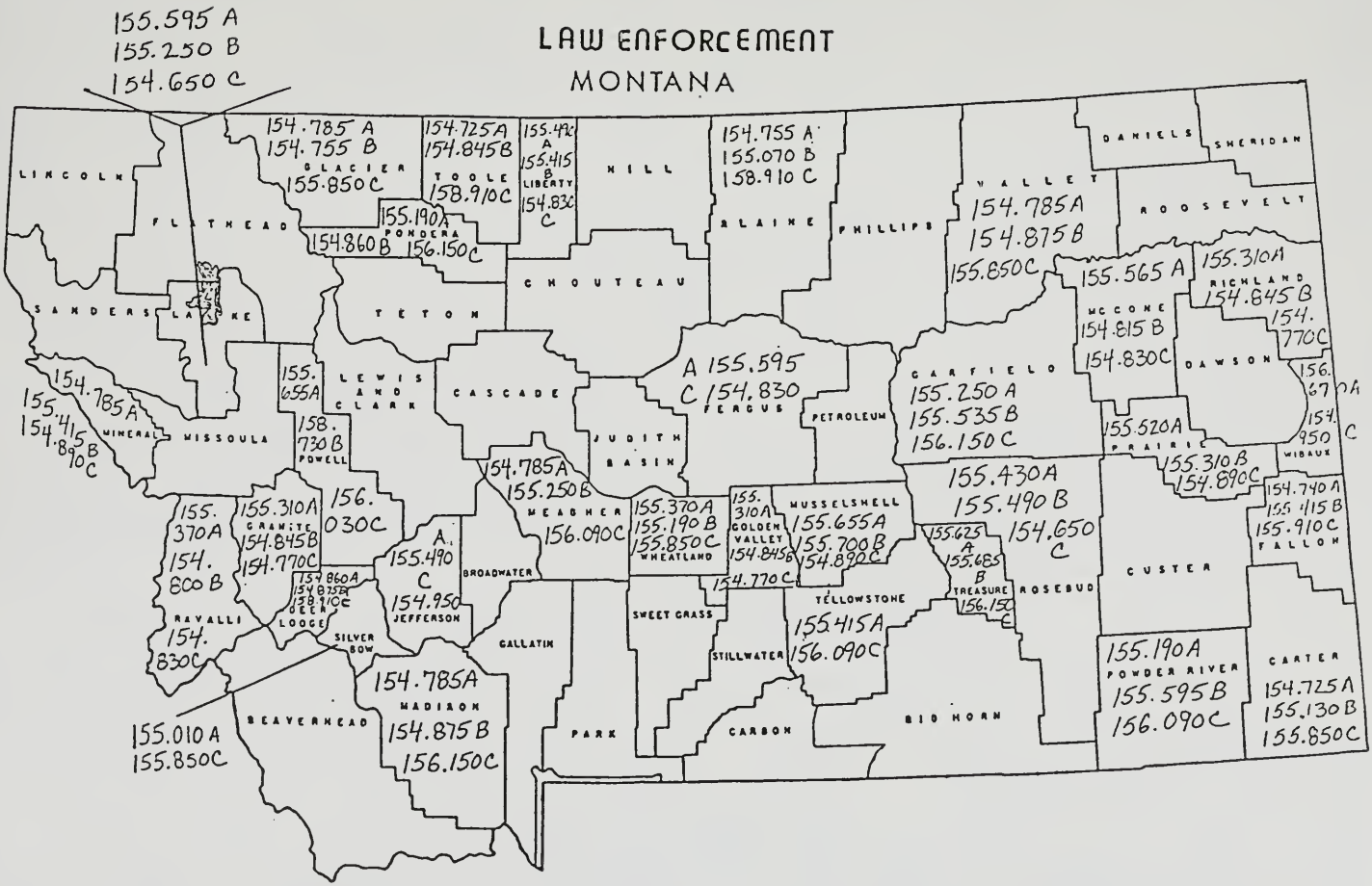
MONTANA



ANNEX 3

LAW ENFORCEMENT

MONTANA



ANNEX 4

100 copies of this public document were published at an estimated cost of $5.25 per copy, for a total cost of $525.00, which includes $525.00 for printing and $.00 for distribution.